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STATE OF NEW HAMPSHIRE

2004 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology

March, 2004

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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CHAPTER 1 INTRODUCTION

1.1 PURPOSE

The Federal Water Pollution Control Act [PL92-500, commonly called the Clean Water Act (CWA)], as last reauthorized by the Water Quality Act of 1987, requires each state to submit two surface water quality documents to the U.S. Environmental Protection Agency (EPA) every two years. Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water.

The second document is typically called the "303(d) List " which is so named because it is a requirement of Section 303(d) of the CWA. The 303(d) List includes surface waters that are:

1. impaired or threatened by a pollutant or pollutant(s)
2. not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources and
3. require development and implementation of a comprehensive water quality study (i.e., called a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

The primary purpose of this document is to describe the process used to make surface water quality attainment decisions for 305(b) reporting and 303(d) Listing purposes. This document is called the Consolidated Assessment and Listing Methodology (CALM) because it includes the methodology for assessing and listing waters (a term used to describe the process for placing waters on the 303(d) list).

Before proceeding it is important to understand that assessment methodologies are dynamic and likely to change as new information and assessment techniques become available. Such changes can also impact monitoring strategies designed to determine if waterbodies are attaining water quality standards. Periodic updates of the methodology will hopefully result in even more accurate and reliable assessments and, therefore, better management of water resources in the future.

1.2 IMPROVEMENTS TO THE ASSESSMENT PROCESS

1.2.1 Assessment and Listing Methodology

This assessment and listing methodology is the most comprehensive and detailed assessment strategy prepared to date for New Hampshire. Such detail

promotes consistency in assessments and allows the public to clearly see how assessment decisions were made.

1.2.2 Integrated Approach for 305(b) / 303(d)

Prior to 2002, New Hampshire, along with many other states, submitted separate 305(b) Reports and 303(d) Lists. To some, this was confusing as it was unclear how waters listed in the two documents were related. In an effort to eliminate this confusion and to simplify reporting for the public as well as regulatory agencies, EPA developed guidance and a computer database (the Assessment Database or ADB) to facilitate integration of the 305(b) and 303(d) List. For the 2002 reporting cycle, New Hampshire was one of the first states in the nation to use this new approach and database.

Based on a state's assessment and listing methodology, the guidance recommends that surface waters within state boundaries be placed into one (and only one) of the following seven categories:

1. Attaining the water quality standard and no use is threatened.
2. Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened (i.e., more data is needed to assess some of the uses).
3. Insufficient or no data and information are available to determine if any designated use is attained (i.e., more monitoring is needed to assess any use).
4. Impaired or threatened for one or more designated uses but does not require development of a TMDL because;
    a. a TMDL has been completed, or
    b. other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future, or
    c. the impairment is not caused by a pollutant.
5. Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) List).

Waters that are meeting water quality standards and are not threatened are included in Categories 1 and 2 with the difference being that all designated uses are supported in Category 1 whereas in Category 2, some, but not all uses are meeting standards. Category 2 and Category 3 waters require more monitoring before a complete assessment can be made. For Category 2 waters, monitoring is needed for those uses that lack sufficient data or information to make an assessment. For Category 3 waters, more monitoring is needed before an assessment can be made for any designated use.

Impaired waters or threatened waters are included in Categories 4A, 4B, 4C and 5. Category 4A includes waters impaired or threatened by a pollutant(s) and a TMDL

study has been completed and approved by EPA. Category 4B includes waters impaired by a pollutant(s), but don't need a TMDL as other pollution control requirements such as technology standards for point sources (i.e., secondary treatment limits) or best management practices for nonpoint sources (i.e., capping of a landfill) are reasonably expected to meet water quality standards in the near future. Category 4C represents waters that are not impaired by a pollutant, such as a lack of sufficient flow to support aquatic life.

If a water is impaired or threatened and does not fall under any of the Category 4 waters, it must, by default, fall under Category 5, which is the 303(d) List. These are waters that are impaired or threatened by a pollutant(s) and require a TMDL.

As discussed, under the integrated approach, all surface waters fall into one of the seven categories. Therefore, this reporting approach satisfies the 305(b) requirement to report on the water quality status of all surface waters. The Integrated Approach also clearly shows how the 303(d) List relates to other waters by assigning it a separate category (Category 5). As indicated, the 303(d) List does not include all impaired or threatened waters; rather it is a subset of the impaired or threatened waters (i.e., waters that are impaired by pollutant(s) and require a TMDL). More information regarding categories used in the Integrated Approach is provided in Section 3.1.3.

1.2.3 Assessment Database (ADB)

To facilitate electronic assessments, EPA developed the "Assessment Database", or ADB, in the 1990s. Though not required, states were strongly encouraged to use this reporting tool to submit electronic reports to EPA. In 2002, EPA released a new Oracle-based version of the ADB that was based on the new integrated approach and its seven categories. For the 2002 cycle, New Hampshire was one of the first states in the nation to use the new ADB. Since 2002, DES has continued to use the latest version of the ADB to conduct surface water assessments.

1.2.4 Assessment Units (AUs) and NHD coverage

Assessment Units (AU) are the basic unit of record for conducting and reporting water quality assessments. In 2002, a new system was developed and implemented to subdivide the surface waters of the state into approximately 5000 smaller segments or AUs. The system is based on 1:100,000 scale hydrography that is linked to the National Hydrography Dataset (NHD); the national coverage used by EPA. These improvements have greatly enhanced the ability of DES to manage and report on the status of the State's water resources. Additional information regarding AUs and the NHD coverage is provided in section 3.1.1.

1.2.5 New Probabilistic Assessment

This year, New Hampshire will be one of the first states to include probabilistic assessments in its report to help satisfy the Section 305(b) goal for States to assess all

surface waters. In 2004, a probabilistic assessment of estuaries in New Hampshire was conducted. In the future it is expected that probabilistic methods will be used to assess other types of surface waters (i.e., lakes, rivers, etc.). For more information about probabilistic assessments, see Section 3.1.26.

CHAPTER 2 WATER QUALITY STANDARDS

2.1 OVERVIEW

Before proceeding with details of the assessment methodology, it is important to obtain a basic understanding of water quality standards since they are the basis of all water quality assessments.

In general, water quality standards provide the baseline quality that all surface waters of the State must meet in order to protect their intended uses. They are the "yardstick" for identifying where water quality violations exist and for determining the effectiveness of regulatory pollution control and prevention programs.

Env-Ws 1700 includes the State's surface water quality regulations (NHDES, 1999). A downloadable copy of the regulations may be obtained from www.des.state.nh.us/wmb/wmbrules.htm.

The standards are composed of three parts: designated uses, water quality criteria, and antidegradation. Each of these components is briefly discussed below.

2.2 DESIGNATED USES

All surface waters of the State are either classified as Class A or B, with the majority of waters being Class B. DES maintains a list that includes a narrative description of all the legislative classified waters. Designated uses represent the desired uses that a waterbody should support. As indicated below, State statute RSA 485-A:8 is quite general with regards to designated uses for New Hampshire surface waters.

Classification	Designated Uses as described in RSA 485-A:8
Class A -	These are generally of the highest quality and are considered potentially usable for water supply after adequate treatment. Discharge of sewage or wastes is prohibited to waters of this classification.
Class B -	Of the second highest quality, these waters are considered acceptable for fishing, swimming and other recreational purposes, and, after adequate treatment, for use as water supplies.

As discussed in section 3.1.2, further review and interpretation of the surface water quality regulations (NHDES, 1999) reveals that that there are actually seven designated uses that the water quality standards are intended to protect.

2.3 WATER QUALITY CRITERIA

The second major component of the water quality standards is the "criteria". Criteria are designed to protect the designated uses of all surface waters and may be expressed in either numeric or narrative form. A waterbody that meets the criteria for its assigned classification is considered to meet its intended use. Water quality criteria for each classification may be found in RSA 485-A:8, I-V and in the State's surface water quality regulations (NHDES, 1999).

2.4 ANTIDEGRADATION

The third component of water quality standards is antidegradation which are provisions designed to preserve and protect the existing beneficial uses and to minimize degradation of the State's surface waters. Antidegradation regulations are included in Part Env-Ws 1708 of the State's surface water quality regulations (NHDES, 1999). According to Env-Ws 1708.03, antidegradation applies to the following:

- Any proposed new or increased activity, including point and nonpoint source discharges of pollutants that would lower water quality or affect the existing or designated uses;
- a proposed increase in loadings to a waterbody when the proposal is associated with existing activities;
- an increase in flow alteration over an existing alteration; and
- all hydrologic modifications, such as dam construction and water withdrawals.

CHAPTER 3 ASSESSMENT AND LISTING METHODOLOGY

3.1 GENERAL RULES

3.1.1 Waterbody Coverage, Waterbody Types and Assessment Units

Waterbody Coverage: This assessment is based on surface waters shown on the 1:100,000 National Hydrography Dataset (NHD), which is consistent with EPA's national coverage. Surface waters for which data was available to make an assessment, but which were not shown on the base NHD coverage, were added to this coverage on a case-by-case basis and linked to the NHD. NHD coverage at a finer scale of 1:24,000 is currently under development. Once complete, DES intends to use this coverage to improve the accuracy of its assessments.

Waterbody Types and Sizes: Based on the NHD coverage and to facilitate reporting, surface waters were separated into the five waterbody types shown below. The total size of each waterbody type, based on the coverage discussed in the previous section, is also provided.

Table 3-1: Waterbody Types and Sizes

Waterbody Type	Total Size	Total Number of Assessment Units
Rivers and Streams	9,612 Miles	3,169
Impoundments	21,752 Acres	812
Lakes and Ponds	164,609 Acres	1,132
Estuaries	17.7 Square Miles	49
Ocean	70.2 Square Miles	27
	Total	5,189

Assessment Units (AUs): Each waterbody type was divided into smaller segments called assessment units (AUs). In general, AUs are the basic unit of record for conducting and reporting the results of all water quality assessments.

AUs are intended to be representative of homogenous segments; consequently, sampling stations within an AU can be assumed to be representative of the segment. In general, the size of AUs should not be so small that they result in an unmanageable number of AUs for reporting. On the other hand, AUs should not be so large that they result in grossly inaccurate assessments.

Many factors can influence the homogeneity of a segment. Factors used to establish homogenous AUs for this assessment are presented in the following table. Based on the criteria shown in Table 3-2, surface waters in New Hampshire were divided into over 5,100 AUs for assessment and reporting purposes.

Since the creation of the Assessment Units for the 2002 assessment some discrepancies have arisen between the AU IDs and HUC-12 boundaries due to NRCS recoding of some HUC-12 regions. DES will reconcile these differences once the HUC-12 boundary recoding and the 1:24,000 NHD is completed.

Table 3-2: Factors used to establish Homogenous and Manageable AUs

Factor	Comments
Waterbody Type	Different waterbody types (i.e., river, lake, impoundment, estuary, ocean) have different water quality standards and may respond differently to pollutants. Consequently, to help ensure homogeneity, different AUs are needed for different waterbody types.
HUC-12 Boundaries	HUC stands for hydrologic unit code. Separate AUs were established wherever 12 digit HUC boundaries were crossed to prevent AUs from becoming too large and to facilitate the naming convention for AUs (discussed below).
Water Quality Standards	All waters represented by an AU should have the same water quality standard; otherwise it's possible that a portion of an AU could meet standards while the other portion is in violation. This would lead to inaccurate assessments.
Pollutant Sources:	The presence of major point and / or no point sources of pollutants can have a significant impact on water quality and, therefore, homogeneity within an AU.
Maximum AU size for rivers and streams	To keep AUs for rivers and streams from becoming too large, the following criteria were applied: AU $\leq$ 10 miles for rivers and streams of 3rd order or less AU $\leq$ 25 miles for rivers and streams greater than 3rd order
Major changes in Land Use	Land use can have a significant impact on pollutant loading and quality of surface waters.
Stream Order/Location of Major Tributaries	Stream order and location of major tributaries can have a significant impact on the quantity and quality of water due to the amount of dilution available to assimilate pollutants.
Public Water Supplies	Separate AUs were developed for these important surface waters to facilitate reporting.
Outstanding Resource Waters	Outstanding Resource Waters are defined in the surface water quality regulations (NHDES, 1999) as surface waters of exceptional recreational or ecological significance and include all surface waters of the national forests and surface waters designated as natural under RSA-483-7-a, I.
Shellfish Program Categories	Tidal waters were divided into AUs based on the classification system for the shellfish program to facilitate reporting.
Designated Beaches	Designated beaches have more stringent bacteria criteria; consequently separate AUs were established for these waterbodies.
Cold water fish spawning areas	Coldwater fish spawning areas have different dissolved oxygen criteria than other surface waters; consequently separate AUs were established for these waterbodies where information was available from the New Hampshire Fish and Game Department.

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AU Naming Convention: Each AU must have a unique identification number (i.e., AU ID) to facilitate tracking and reporting of assessment results for each AU. An explanation of the AU ID naming convention used in this assessment is provided in Table 3-3.

Table 3-3: Explanation of AU ID Naming Convention

Example AU ID: NHRIV801060405-01-01				
NH	RIV	801060405 -	01-	01
State abbreviation to readily identify the waterbody as being in New Hampshire (NH)	3 letters to readily identify the waterbody type where: RIV = Rivers and Streams LAK = Lakes and Ponds IMP = Impoundments EST = Estuary OCN= Ocean	Last 9 digits of the 12 digit HUC. Note that the first 3 digits of all NH HUCs are "010". The first 3 digits (010) were purposely left off in an effort keep the AU ID as short as possible. Inclusion of the last 9 digits readily identifies the general location of the waterbody. 12 digit HUCs do not exist for the ocean (they do, however exist for the estuaries). For the ocean, 000000000 was input into this field.	AU segment number. Segments were divided into homogenous units using the criteria above. For rivers, segment numbering starts upstream and proceeds downstream.	AU subsegment number. Used for further subdivision of AU if necessary. For example, this field was used if it was necessary to divide a lake into 2 or more segments.

3.1.2 Designated Uses

Designated uses are the desirable uses that surface waters should support such as swimming (i.e., primary contact recreation) and fishing (i.e., aquatic life). As discussed in Section 2.2, State statute (RSA 485-A:8) is somewhat general with regards to designated uses for New Hampshire surface waters. Further review and interpretation of the regulations (Env-Ws 1700), however, reveals that the general uses can be expanded and refined to include the seven specific designated uses shown in Table 3-4. Each of these designated uses, with the exception of wildlife, were assessed for this reporting cycle. An assessment methodology for wildlife has not yet been developed but will be included in future assessments.

Table 3-4: Designated Uses for New Hampshire Surface Waters

Designated Use	DES Definition	Applicable Surface Waters
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers	All tidal surface waters
Drinking Water Supply	Waters that with conventional treatment will be suitable for human intake and meet state/federal drinking water regulations.	All fresh surface waters
Primary Contact Recreation (i.e. swimming)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water	All surface waters
Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

3.1.3 Integrated Approach Categories

Each assessment unit (AU) was assigned to one (an only one) of the following seven assessment categories in the Assessment Database (ADB):

AU Category 1: Attaining the water quality standard and no use is threatened.

AU Category 2: Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened (i.e., more data is needed to assess some of the uses).

AU Category 3: Insufficient or no data and information is available to determine if any designated use is attained (i.e., more monitoring is needed to assess any use).

AU Category 4A: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because a TMDL has been completed.

AU Category 4B: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution

control requirements are reasonably expected to result in attainment of the water quality standard in the near future.

AU Category 4C: Impaired or threatened for one or more designated uses but does not require the development of a TMDL because the impairment is not caused by a pollutant, and

AU Category 5: Impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL (this is the 303(d) List).

To determine which AU Category a surface water should be placed in, each impairment was first assigned an Impairment Category of 4A, 4B, 4C, or 5 based on definitions similar to the AU Categories provided above. For example, if an impairment already had an EPA approved TMDL done for it, it would be assigned to Impairment Category 4A. Similarly, if the impairment was not a pollutant, it would be assigned to Impairment Category 4C.

In many cases, an AU was impaired by pollutants and/or nonpollutants with different Impairment Categories. For example, an AU could be impaired by a pollutant assigned to Impairment Category 4C, another pollutant assigned to Impairment Category 4B, as well as a nonpollutant in Impairment Category 4C. For situations such as these, the ADB uses the following protocols to determine which AU Category the surface water should be placed. As indicated in Table 3-5, the AU for the previous example would be assigned to AU Category 4C.

Table 3-5: ADB Protocols for assigning AU Categories

Impairment Category 4A	Impairment Category 4B	Impairment Category 4C	Impairment Category 5	AU Category
Number of Impairments in the AU				
≥ 1	0	≥ 0	0	4A
≥0	≥1	≥ 0	0	4B
0	0	≥ 1	0	4C
≥0	≥0	≥ 0	≥1	5

3.1.4 Use Support Attainment Options and Threatened Flag

Each designated use for each assessment unit (AU) was assigned one of the following four use support attainment options in the ADB:

Fully Supporting: A use is fully supporting if, in accordance with this document, there is sufficient data or evidence for the core indicators (see

Section 3.1.12) to determine that the use is fully supporting and, there is no other data or evidence indicating an impaired or threatened status.

Not Supporting: A use is not supporting (i.e., impaired) if, in accordance with this document, there is sufficient data or evidence to indicate impairment.

Insufficient Information: This option is assigned to any use associated with any AU which, in accordance with this document, has some, but not enough useable data or information to make a final assessment decision.

Not Assessed: This option is assigned to any use associated with any AU, which does not have any useable data or information to make an assessment decision.

Threatened: For any of the use support options noted above, the ADB allows any parameter in an AU to also be flagged as threatened. For this assessment cycle, threatened waters were defined as follow:

- Waters which are expected to exceed water quality standards by the next listing cycle (every two years) and/or,
- Waters that do not have any measured in-stream violations but other data indicate the potential for water quality violations [i.e. see Sections 3.3.19 (predictive models) and 3.3.20 (NPDES permit effluent violations)].

3.1.5 Causes (Pollutants and Nonpollutants) and Sources of Impairment

The Assessment Database (ADB) requires input of causes and sources of threatened or impaired waters. These terms are defined below.

Causes: The “cause” of a threatened or impaired water is an assessment term used to describe the pollutant or nonpollutant, which is causing, or threatening to cause, a water quality violation. In general, a pollutant can be thought of as something which can be expressed in terms of a loading (i.e. pounds per day) and physically allocated. For example, phosphorus and iron are considered pollutants. Only waters which are threatened or impaired by pollutants are eligible for TMDLs.

Conversely, a nonpollutant cannot be expressed in terms of a loading. TMDLs are not required for waters impaired by nonpollutants. Examples of nonpollutants include the following:

Exotic non-native invasive species
Flow alterations or other hydrologic modifications
Habitat degraded by physical conditions

In the ADB, each cause of impairment must be flagged as either a pollutant or nonpollutant.

Sources: The "source" of a threatened or impaired water means the source of the pollutant or nonpollutant, which is threatening or causing water quality violations. For example, atmospheric deposition (acid rain) could be listed as the source of low pH, or wildlife as the source of bacteria violations.

In the ADB, any AU can have more than one cause or source of impairment.

3.1.6 Observed Effects

According to the ADB User's Guide (RTI, 2003), an observed effect is defined as "…any parameter which a State monitors, but that is not defined as an impairment to a designated use in the State's water quality standards." Depending on a State's surface water quality standards, examples of observed effects may include fish kills where the cause was indeterminate or secchi disk readings. Though not impairments of water quality standards, observed effects are nevertheless useful for water quality managers to track.

For this reporting period, only pollutants or nonpollutants which exceeded water quality criteria due to naturally occurring conditions were flagged as observed effects in the ADB. As explained in Section 3.1.7, exceedances of water quality criteria due to naturally occurring conditions are not considered violations (i.e., impairments) of the water quality standards. Conditions which were considered naturally occurring for this reporting cycle are discussed in Section 3.1.7.

3.1.7 "Naturally Occurring" Water Quality Exceedances

In New Hampshire, exceedances of most water quality criteria due to naturally occurring conditions are not considered violations of the water quality standards. According to Env-Ws 1702.29 of the State's surface water quality regulations (NHDES, 1999), naturally occurring conditions means "conditions which exist in the absence of human influences."

Examples given by EPA (USEPA, 1997) of what might be considered naturally occurring conditions, include the following:

- Saline water due to natural mineral salt deposits
- Metals due to naturally occurring deposits
- Low dissolved oxygen (DO) or pH caused by poor aeration or natural organic materials, where no human-related sources are present or where impairment would occur even in the absence of human activity
- Excessive siltation due to glacial till or turbidity due to glacial flour, where such siltation is not caused by human activity or where impairment would occur even in the absence of human activity

- Habitat loss or pollutant loads due to catastrophic floods that are excluded from water quality standards or other regulations.
- High temperature, low DO, or high concentrations of pollutants due to catastrophic droughts with flows less than design flows in water quality standards.

The level of documentation needed to determine if the source is natural is dependent on the pollutant. Mathematical analyses or computer modeling, for example, may be needed for estimating natural levels of dissolved oxygen in some cases. On the other hand, a simple field reconnaissance may suffice to determine if a bacteria exceedance is likely due to man's activities or to wildlife. In either case, documentation is needed to support the "natural" determination.

For this assessment, only the following three conditions were considered naturally occurring (see Section 3.2.4):

- low pH caused by naturally occurring organic acids, where the presence of organic acids is based on color measurements as described in Section 3.2.4,
- Aluminum exceedances due to naturally occurring low pH (low pH can solubilize naturally occurring metals such as aluminum in sediments, resulting in increased water column concentrations),
- pH values greater than 8.0 but less than or equal to 8.5 in tidal waters unless there was evidence to indicate the elevated pH levels were due to human activity.

Although there are other exceedances that are suspected to be of natural origin (such as bacteria exceedances due to wildlife), the source was listed as unknown for this cycle since a process has not yet been clearly defined for determining when the source can be considered natural. As more processes for determining natural occurring conditions are developed and implemented, it is expected that number of waterbodies with exceedances attributed to natural sources will increase.

Currently, the ADB is not set up to specifically address situations where water quality standards allow for excursions of criteria due to natural sources. As previously mentioned, such exceedances are not, by definition, violations of the water quality standards. Consequently, it is not appropriate to assess such waters as impaired in the ADB. Nevertheless, water quality managers find it very useful to keep track of waters with naturally occurring water quality exceedances. For this reporting cycle, this was done by assigning the pollutant or nonpollutant as an Observed Effect (rather than an impairment) in the ADB. For more information on Observed Effects, see Section 3.1.6.

3.1.8 Data Sources

In August 2003, a request for data/information for the 2004 305(b)/ 303(d) submission was sent to the following organizations. The request for information was

also placed on the DES website for the general public (www.des.state.nh.us/wmb). Guidance and a form to facilitate electronic or mailed submissions were included on the website.

Appalachian Mountain Club
Audubon Society
Connecticut River Joint Commissions
Conservation Law Foundation
County Conservation Districts
Manchester Conservation Commission
Merrimack River Watershed Council
National Park Service
Natural Resources Conservation Service
New Hampshire Lakes Association
New Hampshire Rivers Council
North Country Council
Regional Planning Commissions
Society for the Protection of National Forests
Souhegan River Watershed Association
The Nature Conservancy
University of New Hampshire (UNH)
Upper Merrimack River Local Advisory Committee
U.S. Environmental Protection Agency
U.S. Geological Survey
U.S. Fish and Wildlife Service
U.S. Forest Service

Information/ data received from the above was assessed in accordance with this methodology. Other data sources consulted for this assessment include the following:

2002 NH Section 305(b)/303(d) Surface Water Quality Assessment (www.des.state.nh.us/wmb/swqa)
Baker River Watershed Association
DES Acid Rain-Lake Monitoring Program
DES Ambient Rivers Monitoring Program (ARMP)
DES Beach Program (freshwater and coastal beaches)
DES Biomonitoring Program
DES Copper Sulfate Treatment Files
DES Juvenile Camp Inspection Program (administered by the WSEB)
DES Lake Diagnostic Feasiblity Studies
DES Lake trophic surveys
DES Permits and Compliance Section (NPDES permits)
DES Section 319 Program (nonpoint source projects)
DES Section 401 Water Quality Certification Program
DES Shellfish Program

DES State Clean Lakes program (nuisance aquatic growths including exotic species)
DES TMDL Program
DES / UNH National Coastal Assessment, Water Quality Monitoring Program
DES Volunteer Lakes Assessment Program (VLAP – includes volunteer data from over 100 lakes)
DES Volunteer Rivers Assessment Program (VRAP – includes data from approximately 10 volunteer monitoring groups)
DES Waste Management Division (hazardous waste sites, landfills, etc.)
DES Watershed Assistance Section (nonpoint source investigations)
DES Water Supply Engineering Bureau (public water supplies)
DES Water Quality Complaint files
Great Bay Coast Watch Water Quality Monitoring Program
NH Department of Health and Human Services (fish/shellfish consumption advisories)
NH Estuary Project (NHEP) Monitoring
NH Fish and Game National Estuarine Research Reserve (NERR) System Wide Monitoring Program
US Navy Interim Offshore Monitoring Program for the Portsmouth Naval Shipyard.

3.1.9 Data Quality

Data used to make final assessment decisions, must be defensible. Consequently it is extremely important that the quality of the data is known. This includes information about the procedures used for sample collection, sample analysis, data analysis and data reporting.

The ADB requires documentation of the data quality used to make a final assessment decision. In terms of the ADB, this is called the “level of information” for which there are four options to select from:

Low
Fair
Good
Excellent

Criteria for determining the appropriate level are provided in the table below. As shown, only data which is considered to be Fair, Good, or Excellent can be used to make a final assessment. As a reference, quality assurance/quality control (QA/QC) procedures used by the DES are considered Good to Excellent and were used to help determine appropriate levels for data collected by others.

Data or information that is assigned a Low level is not considered defensible for use in final assessments. Such data, however, can and is used for making preliminary or screening level assessments, which help guide future monitoring efforts.

Table 3-6: Level of Information Descriptions for Data Quality

Level of Information	Description *	Assessment Applicability	Use Support Option(s) that can be used with this level of information
Low	SOPs or QA/QC plan are not available or were not provided. SOPs or QA/QC plan is available but protocols were not followed, QA/QC results are inadequate, and /or there is inadequate metadata.	Screening Level assessments only	Not Assessed
Fair	SOPs or a QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers had some training;	Final Assessments	"Insufficient Information" "Fully Supporting" "Not Supporting"
Good	An acceptable QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers were well trained.	Final Assessments	"Insufficient Information" "Fully Supporting" "Not Supporting"
Excellent	An acceptable QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers were well trained and audited.	Final Assessments	"Insufficient Information" "Fully Supporting" "Not Supporting"

*SOP stands for Standard Operating Protocols
*QA/QC stands for Quality Assurance/ Quality Control

Use of Volunteer Data: In New Hampshire there are two very active volunteer monitoring programs coordinated by DES: the Volunteer Lake Assessment Program (VLAP) and the Volunteer River Assessment Program (VRAP). The quality of this data is considered to be Good to Excellent in most cases; consequently, the majority of

Volunteer data collected was used to help make assessment decisions for this reporting cycle.

3.1.10 Data Age

Use of out-dated information can result in assessments that are not representative of actual conditions in the waterbody. It is therefore important to establish data age requirements to increase the accuracy of assessments.

Obviously, the more current the data the more accurate the assessment. However, setting a maximum data age of one year, for example, would result in very few waters ever being assessed due to a lack of resources to collect the necessary data each year. Consequently, establishment of data age requirements must strike a balance between the desires to have the most current data possible, the amount of data needed to make an assessment, and the resources and time needed to collect the data. Bearing this in mind, maximum data age requirements for making use support decisions are shown in Table 3-7.

The data age requirements shown in Table 3-7 apply in all cases except waters previously listed as threatened or impaired. In such cases, the data used to make the original assessment, regardless of its age, was included in the reassessment provided it met all other data requirements (including the minimum number of samples) stipulated elsewhere in this assessment methodology. This was done to prevent removal of waters from a threatened or impaired category based solely on data age.

It should also be noted that although the maximum data age requirement for lakes and ponds is 10 years (versus five years for the other waterbody types), it has been found that the water quality of many lakes and ponds do not change dramatically with time due to their large volume and retention times (often on the order of years). Consequently use of 10 year old data for lakes and ponds, though not ideal, is believed to provide a reasonably accurate assessment of water quality conditions in most cases.

Table 3-7: Maximum Age of Data for Use in Assessments

Waterbody Type	Maximum Age of Data Eligible for Making Assessments (except for waters previously listed as threatened or impaired)
Rivers and Streams Impoundments Estuaries Ocean	5 years
Lakes and Ponds	10 years

3.1.11 Values Below Detection Limits

Results of many water quality samples are reported as below the analytical detection limit (nondetects). In such cases, the actual value is not known. When nondetect values were reported and an actual value was needed for making an

assessment, 50 percent of the analytical detection limit was used as the value. For bacteria results reported as "0" counts, the zero values were replaced with 0.01 counts so that the geometric mean could be calculated.

3.1.12 Core Parameters

For any designated use, there are often many parameters that can be used to determine if the water is impaired (not supporting) or threatened. Criteria for making these decisions are described in this document. If any one of the parameters indicate a threatened or impaired status, as defined in this document, then the water will be reported as threatened or impaired in the ADB and placed in category 4A, 4B, 4C or 5.

However, to determine if a water is fully supporting a particular use, it is necessary to identify the minimum number of parameters needed to make this decision. This is because it is not feasible to sample every parameter that may affect a use.

The parameters comprising the minimum data set needed to assess a water as fully supporting are called core indicators. Core indicators are often different for each designated use. As a minimum, monitoring strategies designed to make use support assessments need to include the core indicators.

Table 3-8 shows what the final attainment status would be in the ADB based on the individual attainment status of the core indicators or other parameters. As shown, in order for a use to be assessed as fully supporting, all of the core indicators for that use must be fully supporting, and none of the data associated with the core indicators, or any other parameter used in the assessment, can indicate a threatened or impaired status, as defined by this document. If there is insufficient information for the core indicators to make an attainment decision, and there are no other parameters that indicate a threatened or impaired status, the attainment status will be reported as "insufficient information". This is true even if the attainment status of other parameters (which are not core indicators) are fully supporting. If however, any of the core indicators and/or other parameters are threatened or impaired, the use will be reported as threatened or impaired. Core indicators for each designated use are presented in Section 3.2.

Table 3-8: Use Support Options based on Core Indicators and Other Parameters.

Use Support Status based on assessment of Core Indicator(s)	Use Support Status based on Assessment of Other Parameters	Final Use Support Status listed in the ADB
Fully Supporting	Fully Supporting	Fully Supporting
Fully Supporting	Insufficient Information	
Insufficient Information or Not Assessed	Fully Supporting	Insufficient Information or Not Assessed
Insufficient Information	Not Supporting	Not Supporting
Fully Supporting	Not Supporting	
Not Supporting	Not Supporting	
	Fully Supporting	
	Insufficient Information	

3.1.13 Definition of Independent Samples

As discussed in Section 3.1.16, assessments for most uses are very dependent on the number of "independent samples" taken. It is therefore necessary to define what constitutes an "independent sample" for assessment purposes.

For this assessment, independent samples were defined as:

- Samples taken at least 500 feet (horizontally) from each other regardless of when the samples were taken or, samples taken on different calendar days regardless of the horizontal separation between samples.

Where there were multiple samples (including samples taken at different depths) taken on the same calendar day and located less than 500 feet horizontally from each other, the worse case value was used as the independent sample for that day and location unless otherwise noted in Section 3.2.

For lakes, ponds and large impoundments, only data from the upper layers (i.e., the epilimnion) was used.

3.1.14 Aggregation of Samples within an Assessment Unit

As stated in Section 3.1.1, one of the basic premises governing the establishment of assessment units (AUs) was that they should be homogenous. Assuming all AUs were created to be relatively homogenous, it follows that any independent sample taken from an AU is representative of conditions in the AU. Since each independent sample is considered to be representative of the AU, aggregation of independent samples within an AU to assess an AU was allowed.

3.1.15 Spatial Coverage per Sample Site

Spatial coverage is the miles of river or acres of lake, for example, that are assumed to be represented by an independent sample. This statistic is critical for assessments because without it, it would not be possible to estimate the size of waters for the various use support options (e.g., the miles of rivers and streams that are fully supporting or not supporting).

Assuming a very large coverage per station (e.g., 500 miles per sample site) would result in many miles of river being assessed per sample site. However, the assessment would not be very accurate or defensible unless the upstream watershed was relatively homogenous with regards to the many factors which can influence the impact of a pollutant on a surface water (i.e., waterbody type, physical characteristics, land use, pollutant sources, etc). It is doubtful that all surface waters in such a large watershed would be that homogenous.

As discussed in section 3.1.1, assessment units (AUs) were established with the intent that they would be homogenous. Consequently, it is appropriate to assume that any independent sample site within an AU is representative of water quality conditions within the AU. With regard to spatial coverage per independent sample site, this translates to the ranges shown in Table 3-9, which assumes only one site per AU. In many cases there were multiple independent sample sites within an AU, which would decrease the average coverage per site. Also presented in Table 3-9, for comparison purposes, are coverages recommended or referenced in EPA guidance (USEPA, 1997). As shown, coverages used in this assessment are below those in EPA guidance and therefore are reasonable based on current practice.

Finally, it is important to understand that for this assessment, information pertaining to an AU was reported for just that AU. That is, data from one AU was not used to assess another AU.

Table 3-9: Spatial Coverage per Independent Sample

Waterbody Type	Units	Spatial Coverage assuming 1 independent sample site per AU	Spatial Coverage recommended or referenced in EPA guidance (USEPA, 1997)
Freshwater Rivers and Streams	Miles	Average: 3.04 Minimum: 0.01 Maximum: 19.18	Wadable Streams: No more than 5 to 10 miles per station. Large rivers: No more than 25 miles per station
Freshwater Impoundments	Acres	Average: 26.83 Minimum: 0.01 Maximum: 3800	None discussed in EPA guidance
Freshwater Lakes and Ponds	Acres	Average: 146.9 Minimum: 0.097 Maximum: 44,585	Site specific
Estuaries	Square Miles	Average: 0.36 Minimum: 0.0021 Maximum: 4.73	Per EPA guidance (USEPA, 1997) the Washington Department of Ecology uses the following coverage: Open waters: Within a 4 mile radius, which translates to 50 square miles per sampling site. Bay stations: Within a 2 mile radius, which translates to 14 square miles per sampling site. Highly sheltered bays: within a ½ mile radius, which translates to 0.8 square miles per sample site.
Ocean	Square Miles	Average: 2.68 Minimum: 0.0003 Maximum: 41.58	See Estuaries

3.1.16 Minimum Number of Samples - Binomial Method

The number of samples needed to make a use support decision plays a large role in how defensible and believable the assessment is. Calling a waterbody impaired based on only one sample, for example, always seems questionable no matter how reliable the data may be. But what should the minimum number of samples be before an assessment can be made? As discussed below, statistics can help answer this question.

One can never have enough data. The more data there is, the more confident one can be that the data represents actual conditions. In statistical terms the entire collection of all measurements is called the population. Since it is impossible to sample the entire population, it is necessary to try to describe the population based on a subset of the measurements. By doing so, some error is always introduced. Consequently, having an idea of the relationship between error and the number of samples taken to represent the population is of interest.

For water quality assessments, there are basically two types of error; Type I and Type II, which are defined in Table 3-10. To obtain an estimate of the probability of committing Type I and / or Type II errors a statistical tool called the binomial method may be used.

Table 3-10: Definition of Type I and Type II Errors for Assessments

Error	Definition
Type I	The waterbody is assessed as impaired when it is really fully supporting
Type II	The waterbody is assessed as fully supporting when it is really impaired

The binomial method can calculate Type I and II error rates for various combinations of sample size and number of exceedances needed to assess a waterbody as impaired. In order to perform these calculations, however, it is necessary to specify the “actual exceedance rate” in the waterbody for each error type. For Type I and Type II errors, an actual exceedance rate of 10 percent and 25 percent, respectively, was assumed. This is consistent with EPA guidance (USEPA, 1997) which recommends assessing a water as fully supporting if the percentage of exceedances for certain pollutants (dissolved oxygen, acute toxicity, bacteria, water temperature and pH) was 10 percent or less. For assessing a water as not supporting, the guidance recommends that the percentage of exceedances equal 25 percent or more. In general, the higher the actual exceedance rate, the lower the error.

When selecting the appropriate combination of sample size and number of exceedances to assess a water as impaired, the goal is to balance and minimize the

error rates as much as possible while keeping the number of samples required to make an assessment within reason. For many (but not all) of the indicators used in this assessment, Table 3-11 was used which is primarily based on maintaining the Type I error at or below 20 percent; that is, no more than a 20 percent error that a waterbody is improperly assessed as impaired, when it is really fully supporting. The detailed use support criteria presented in Section 3.2 indicate the parameters which were dependent on the binomial method for making assessments.

In accordance with Table 3-11, and for many of the parameters indicated in Section 3.2, a minimum of 10 samples is needed before a parameter can be considered attaining standards. Assuming there are 10 samples, up to 2 of the samples can exceed criteria, and the parameter will still be considered to be meeting standards. As the number of samples increase, the number of exceedances allowed also increases. For example, if 20 samples are taken, Table 3-11 shows the parameter would be considered as meeting standards as long as no more than 3 of the 20 samples exceed criteria.

Table 3-11 also shows the number of exceedances needed to assess a water as impaired as a function of the total sample size. For example, if the total number of samples is less than 15, a parameter would be considered in violation of its criteria if there are 3 or more exceedances. If there are between 16 and 23 samples (inclusive), the number of exceedances required to call a waterbody impaired increases to 4.

At a sample size of 10, Table 3-11 shows that there is a 7 percent chance of improperly listing a water as impaired (Type I error) and a 53 percent chance of improperly assessing a water as fully supporting when it is actually impaired (Type II error). As sample size increases, the Type I and II errors generally become closer in agreement.

In general, the number of exceedances needed to assess a water as impaired increases and the difference between the Type I and II errors decreases, as the sample size increases. As indicated in the following section (Magnitude of Exceedance Criteria), however, there are circumstances where only 2 exceedances are needed to make an impairment decision. Also, as discussed in Section 3.1.26, the minimum samples size requirements discussed in this section and in Section 3.2, do not apply to probabilistic assessments.

Table 3-11: Sample Size and Minimum Number of Exceedances (Binomial Method)

Sample Size	Minimum # of exceedances to call a waterbody impaired	Type I Error (1,3)	Type II Error (2)	Sample Size	Minimum # of exceedances to call a waterbody impaired	Type I Error (1,3)	Type II Error (2)
10	3	0.07	0.53	56	8	0.19	0.02
11	3	0.09	0.46	57	9	0.11	0.03
12	3	0.11	0.39	58	9	0.12	0.03
13	3	0.13	0.33	59	9	0.13	0.02
14	3	0.16	0.28	60	9	0.14	0.02
15	3	0.18	0.24	61	9	0.15	0.02
16	4	0.07	0.40	62	9	0.16	0.02
17	4	0.08	0.35	63	9	0.17	0.01
18	4	0.10	0.31	64	9	0.19	0.01
19	4	0.11	0.26	65	9	0.20	0.01
20	4	0.13	0.23	66	10	0.12	0.02
21	4	0.15	0.19	67	10	0.13	0.02
22	4	0.17	0.16	68	10	0.14	0.01
23	4	0.19	0.14	69	10	0.15	0.01
24	5	0.09	0.25	70	10	0.16	0.01
25	5	0.10	0.21	71	10	0.17	0.01
26	5	0.11	0.18	72	10	0.18	0.01
27	5	0.13	0.16	73	10	0.19	0.01
28	5	0.14	0.14	74	11	0.12	0.01
29	5	0.16	0.12	75	11	0.13	0.01
30	5	0.18	0.10	76	11	0.14	0.01
31	5	0.19	0.08	77	11	0.14	0.01
32	6	0.09	0.15	78	11	0.15	0.01
33	6	0.11	0.13	79	11	0.16	0.01
34	6	0.12	0.11	80	11	0.17	0.00
35	6	0.13	0.10	81	11	0.18	0.00
36	6	0.15	0.08	82	11	0.19	0.00
37	6	0.16	0.07	83	12	0.12	0.01
38	6	0.17	0.06	84	12	0.13	0.01
39	6	0.19	0.05	85	12	0.14	0.00
40	7	0.10	0.10	86	12	0.15	0.00
41	7	0.11	0.08	87	12	0.16	0.00
42	7	0.12	0.07	88	12	0.17	0.00
43	7	0.13	0.06	89	12	0.18	0.00
44	7	0.15	0.05	90	12	0.19	0.00
45	7	0.16	0.04	91	12	0.20	0.00
46	7	0.17	0.04	92	13	0.13	0.00
47	7	0.19	0.03	93	13	0.14	0.00
48	8	0.10	0.06	94	13	0.14	0.00
49	8	0.11	0.05	95	13	0.15	0.00
50	8	0.12	0.05	96	13	0.16	0.00
51	8	0.13	0.04	97	13	0.17	0.00
52	8	0.14	0.03	98	13	0.18	0.00
53	8	0.16	0.03	99	13	0.19	0.00
54	8	0.17	0.02	100	13	0.20	0.00
55	8	0.18	0.02				

Notes:
1. Type I error assumes a 10% actual exceedance rate.
2. Type II error assumes a 25% actual exceedance rate
3. The number of exceedances required to assess a water as impaired is based on maintaining a Type I error of no more than 20%.

3.1.17 Magnitude of Exceedance Criteria (MAGEXC)

The binomial table discussed in the previous section is a good, statistically-based, defensible tool for determining the minimum number of water quality violations needed to assess a water as impaired under most conditions. It does not, however, account for situations where water quality criteria are exceeded by large amounts and it is obvious that there is impairment. In such cases, just a few samples should be needed to make an impairment decision.

To address these situations, "Magnitude of Exceedance Criteria" (MAGEXC) were established for many of the assessment parameters presented in Section 3.2. As shown in Section 3.2, MAGEXC are typically set well above the standard water quality criteria; consequently when MAGEXC criteria are exceeded, one can be reasonably confident that there is impairment. As a general rule, if two or more samples exceeded the MAGEXC, waters were assessed as impaired (i.e., not supporting).

3.1.18 7Q10 Low Flow and Mixing Zone Criteria

7Q10 low flow: According to Env-Ws 1705.02 of the State's surface water quality regulations (NHDES, 1999), the flow used to calculate permit limits (i.e., NPDES permits for wastewater discharges) for aquatic life criteria and human health criteria for non-carcinogens, shall be the 7Q10 low flow, which is the average seven day low flow that occurs, on the average, once every ten years. This implies that water quality criteria for human health and non-carcinogens do not apply at flows below the 7Q10 in waters receiving wastewater discharges. Consequently, assessment of surface waters downstream of wastewater discharges were only based on samples taken when river flows were at or above the 7Q10 low flow, as determined by DES.

Mixing Zones: Env-Ws 1702.27 of the State's surface water quality regulations (NHDES, 1999), defines a mixing zone as the a defined area or volume of the surface water surrounding or adjacent to a wastewater discharge where the surface water, as a result of the discharge, might not meet all applicable water quality standards. Mixing zones are prohibited in Class A waters (Env-Ws 1707.01(a)) but are allowed in Class B waters, where designated by DES, if they meet the conditions stipulated in Env-Ws 1707.02 (Minimum Criteria) and Env-Ws 1707.03 (Technical Standards).

Consistent with the above, water quality data used to make assessments were based on samples taken outside of DES designated mixing zones for wastewater treatment facilities. For wastewater treatment facilities where DES has not yet designated an official mixing zone, water quality data used for assessment purposes was from samples taken at least 500 feet downstream of the WWTF discharge.

3.1.19 Use of Predictive Models

A waterbody with potential violations based on predictive modeling, was assessed as threatened instead of impaired (not supporting), to reflect the fact that the

violation is predicted and not based on actual measured in-stream violations, provided that the following conditions apply:

- The model is calibrated and verified and is considered to be representative of current conditions.

- The model predicts water quality violations under existing loading conditions, and/or under enforceable pollutant loadings stipulated in a NPDES permit.

Assuming that modeling predicts a violation, and assuming that this is the only violation in the waterbody, such waters were assessed as threatened and assigned an Impairment Category of 4A, 4B, 4C, or 5 depending on the cause of the threat (pollutant or nonpollutant), the source(s) of the threat, if a TMDL was necessary or if other controls would result in attainment of water quality standards.

Impairment Category 5 was assigned if the surface water was threatened by a pollutant, a TMDL had not yet been done, and the remedy to meet water quality standards was not clear. A good example is when modeling indicates that advanced treatment at a NPDES WWTF, as well as nonpoint source controls, are necessary to meet dissolved oxygen standards. In such cases the TMDL process would identify all sources and pollutant reductions necessary to meet water quality standards (including NPDES effluent limits).

Impairment Category 4B was assigned, however, when modeling predicted a violation for a pollutant where the primary source and the remedy is clearly known. An example is when dilution calculations used to determine NPDES permit effluent limits for toxic substances (such as chlorine or ammonia), that are normally below detection limits in surface waters, indicates a potential for in-stream violations based on measurements in the effluent. In such cases there is no need to allocate loads among sources as the primary source and solution is clear: include effluent limits for the toxics of concern in the NPDES permit for the WWTF (which are enforceable) and require the WWTF to implement measures that will bring it in compliance with its NPDES permit.

3.1.20 NPDES Permit Effluent Violations

Waters receiving effluent from wastewater treatment facilities (WWTF) that have recently violated their NPDES permit effluent limits, were assessed as threatened with the following conditions:

- The wastewater treatment facility (WWTF) is currently in “significant non-compliance” of its NPDES permit (as defined by EPA), or is on the “exceptions list” (i.e. facilities that are in significant non-compliance for two or more quarters), for one or more of its permitted water quality based pollutant effluent limits. Water quality based effluent limits are limits based on modeling or dilution calculations to meet water quality standards.

- Violations of technology based permitted effluent limits (i.e., secondary limits for municipal WWTFs) were not listed as threatened.

Such waterbodies were assessed as threatened and assigned to Impairment Category 4B because the allowable pollutant loading needed to meet water quality standards has already been established in the NPDES permit (an enforceable document); consequently a TMDL is not needed. Since the target for meeting water quality standards is known, the next step is to develop and implement a plan to bring the discharger into compliance with its NPDES permit as soon as possible.

3.1.21 Pollutants with Unknown Sources

Pollutants with unknown sources causing impairment or threatened conditions were assessed as threatened or impaired and assigned to Impairment Category 5. If future investigations indicate that the source is primarily natural, the water will be removed from the impaired waters list for reasons discussed in section 3.1.7.

3.1.22 Weight of Evidence Approach for Aquatic Life Use Support Decisions

As indicated in Section 3.2, physical, chemical, toxicological, biological and/or habitat indicators can be used to assess the aquatic life use. If data for more than one indicator is available for assessments this can sometimes lead to conflicting assessment results. That is, one indicator might suggest that the designated use is not supporting (NS) while others may indicate a fully supporting (FS) use attainment status.

To resolve cases with conflicting data, DES uses a weight of evidence approach to make final assessment decisions. In general, this approach involves "weighing" the factors shown in the following table for each of the indicators. The assessment is then based on the indicator(s) with the highest weight (i.e., score). More specific criteria for resolving differences between biological and habitat assessments is provided in Section 3.2.4.

Table 3-12: Factors Considered in the Weight of Evidence Approach

Factor	Comments
Data Quality (Sampling and Analysis Protocols)	Data of high quality is given more weight than data of low quality.
Sample Time	Usually more weight is given to data which is the most recent, but one must also consider if samples were taken at times when exceedances are most likely to occur (i.e., the critical period). For example, when sampling for dissolved oxygen in rivers, water quality exceedances are most likely to occur during the summer months in the early morning when river flows are low and temperatures are high. If data for Indicator A indicated FS

Factor	Comments
	and was more recent but was not collected during the critical period, and data for Indicator B was older but indicated NS, more weight would be given to Indicator B as Indicator A data was not collected during the critical period.
Sample Location	Although AUs are theoretically homogenous, in reality, water quality differences can and do occur within an AU. In general, more weight is given to data that is collected the furthest downstream in an AU as it is more representative of all conditions affecting the AU. However this is not always the case.
Quantity of Samples	In general, more weight is given to the Indicator which has the most data as it is more likely to be representative of the population being sampled.
Type of Data (i.e., physical, chemical, toxicological, habitat and/or biological)	It is generally believed that for making aquatic life use assessments, biological data should be weighted more heavily than physical, chemical, habitat or toxicological data. This is because high quality biological data provide a direct measure of aquatic life and detect the cumulative impact of multiple stressors on the aquatic community including new or previously undetected stressors over time. Physical/chemical data, on the other hand, provides a snapshot of river conditions when the samples were taken and do not account for the long term effects of stressors or the presence of other pollutants which may be impairing the biota.

3.1.23 Process for Determining Waters that Belong on the 303(d) List (Category 5)

Pollutants assigned to Impairment Category 5 (and their associated AUs), constitute the 303(d) List (see Section 3.1.3).

De-listing is the term commonly used to describe the process of removing a pollutant from the 303(d) list (Impairment Category 5). According to federal regulation (40 CFR 130.7), states must demonstrate “good cause” for not including waters on the list. Good cause can include, but is not limited to:

- more recent or accurate information,
- more sophisticated water quality modeling,
- flaws in the original analysis that led to the water being listed,
- changes in conditions (e.g., new control equipment, or elimination of discharges.

Consistent with the above, the following process was used to determine which impaired or threatened waters belonged on the 303(d) list (Impairment Category 5) and

which should be listed in the other Impairment Categories (4A, 4B, or 4C). This process was carried out for each individual pollutant that threatens or causes impairment in an AU, as it is possible that one cause of impairment may require a TMDL but another does not.

Step 1: Is the cause of the threatened or impaired water a pollutant?

To be eligible for assignment to Impairment Category 5, the waterbody must be threatened or impaired by pollutant(s) rather than nonpollutant(s) as defined and discussed in Section 3.1.5.

If the cause is known to be a pollutant, or, if it is not known if the cause is a pollutant or nonpollutant, proceed to step 2.

If the cause was due to a nonpollutant, the cause of impairment was flagged as a nonpollutant and assigned to Impairment Category 4C.

Step 2: Has a TMDL already been completed for the pollutant?

Having determined that the cause is due (or possibly due) to a pollutant, the next step is to determine if a TMDL has already been conducted for that pollutant in that waterbody.

If a TMDL has not been conducted, proceed to step 3.

If a TMDL has been conducted and has been assigned a TMDL ID approval number by EPA, the pollutant was placed in Category 4A.

Step 3: Is the source of the exceedance due to natural conditions?

The next step is to determine the source of the pollutant as this can influence whether a TMDL is needed and, consequently, if the pollutant should be assigned to Impairment Category 5.

As discussed in Section 3.1.7 exceedances of most water quality criteria due to naturally occurring conditions are allowed and are not considered violations of the water quality standards. Since such waters are not technically in violation of the standards, a TMDL is not necessary for waters impaired or threatened by naturally occurring sources.

If the primary source is not natural, proceed to step 4.

If the source of the pollutant was confirmed as natural in accordance with Section 3.1.7 the waterbody was no longer considered impaired or threatened by that pollutant. In such cases the cause of exceedance was changed from a Pollutant to an Observed Effect in the ADB (see Section 3.1.6).

Step 4: Are there other pollution control requirements that are reasonably expected to result in attainment of water quality standards in the future?

The last step for determining if a waterbody should be assigned to Impairment Category 5 is to evaluate whether controls other than a TMDL are likely to result in attainment of water quality standards in the near future. According to EPA guidance (USEPA, 2003), a pollutant may be assigned to Impairment Category 4B instead of 5 if it can be demonstrated that other pollution control requirements required by local, state, or federal authority are stringent enough to implement any water quality standard applicable to such water. The process of placing a pollutant in Impairment Category 4B instead of 5 is often called "Off-Ramping".

Off-Ramping situations are handled on a case-by-case basis. Examples of situations which have been approved by EPA in the past for Off-Ramping include the following:

- Bacteria impairments due primarily to discharges of untreated human sewage (i.e., due to illicit connections or combined sewer overflows) where an enforceable order or evidence that the source has been removed, and that will result in attainment of water quality standards.
- Waters where restoration efforts are underway or complete and there is an enforceable permit in place that requires attainment of water quality standards. Examples include landfills that have been closed and capped to control iron and/or manganese violations in adjacent surface waters and have Groundwater Management Permits in place which require compliance with NH Surface Water Quality Regulations (DES, 1999).
- Waters listed as threatened due to NPDES permit effluent violations of toxics such as copper or zinc(see Section 3.1.20).
- Waters listed as impaired primarily due to the residual effects of an NPDES discharge which is now meeting its NPDES permit limits. An example is the paper mill in Berlin, NH which used to discharge significant amounts of dioxin to the Androscoggin River. This resulted in the issuance of a fish consumption advisory due to elevated dioxin levels in fish tissue. In the 1990's the mill changed its bleaching process which reduced dioxin levels to below detection levels and allowed the mill to meet its NPDES permit limit for dioxin. In time it is expected that fish tissue concentrations will continue to drop to levels low enough to allow the dioxin fish consumption advisory to be rescinded.
- Section 319 Nonpoint Source restoration projects which have funding and where it can be demonstrated that controls will be

implemented and there is reasonable assurance that the project will result in attainment of water quality standards.

If a pollutant was not eligible to be placed in Impairment Category 4A or 4B, and if water quality exceedances were not due to natural conditions, the pollutant was, by default, assigned to Impairment Category 5 and included on the 303(d) List.

3.1.24 Reasons Why a Waterbody May Change Categories (including De-listing)

Once a waterbody is in a particular AU Category (see Section 3.1.3) for one or more reporting cycles, it may be switched to another AU Category for any of the reasons shown below. This also applies to removing or "de-listing" waters from the 303(d) list.

- If *new data or information* (including more sophisticated modeling) indicates that the category previously assigned to the AU should be changed based on the most current assessment methodology.

- If *flaws are found in the original analysis* which indicates that the AU was improperly assessed and that the AU should be placed in another category.

- If there are *changes in the assessment methodology* and reassessment indicates that the AU should be placed in another category. This includes changes in water quality standards and/or changes in surrogate water quality criteria used to make use support decisions.

3.1.25 TMDL Priority Ranking

Section 303(d) of the Clean Water Act requires that waters on the 303(d) List be ranked in order of priority that the TMDLs will be developed. For this cycle, and in accordance with EPA guidance (USEPA, 2003), the priority for TMDL development is indicated by the TMDL Schedule date shown on the 303(d) List which indicates when the TMDL is expected to be completed. The assumption is that the sooner a TMDL will be completed, the higher its priority.

The tables below give an idea of the two-step thought process used to prioritize TMDLs in New Hampshire. As shown in Table 3-12, a preliminary rank of high, medium or low is first established based on the water resource that is impacted and whether the pollutants pose a threat to human health or to federally listed threatened or endangered species. Knowing the preliminary water resource ranking, the final TMDL priority ranking is then determined by consulting Table 3-13, which includes other important institutional and technical factors that can influence the priority of TMDLs.

As previously mentioned, the intent is to first work on TMDLs ranked as high, followed by medium and low priority TMDLs. A list of TMDLs currently being worked on may be found on the DES website at www.des.state.nh.us/wmb/tmdl.

It should be understood that rankings and TMDL schedules are dynamic and subject to revision due to changes in any one of the institutional or technical factors shown in Table 3-13. It should also be noted TMDL schedules are not always a good indicator of priority. For example, a high priority TMDL could take 5 to 10 years to complete because it is very complex, very controversial and require a large amount of data to be collected before the TMDL can be completed. Using the TMDL Schedule as an indicator of priority, any TMDL with a completion date of less than 5 years would be assumed to have a higher priority, which may, or may not be true.

Before proceeding, it should be noted that for waters threatened or impaired by regional pollutants which are beyond the ability of the State to control, it is recommended that EPA take the lead in conducting TMDLs. Examples of regional pollutants include acid rain, and mercury, polychlorinated biphenyls (PCBs) and dioxin associated with fish and / or shellfish consumption advisories.

Table 3-13: Preliminary TMDL priority based on water resource factors

Water Resource Impacted	**Entity at Risk**	
Do the pollutant(s) pose a threat to the **1) viability of a potable water supply,** **2) an Outstanding Resource Water as defined in Env-Ws 1700** **3) waters designated as "natural" under the Rivers Management and Protection Act (RSA 483), and / or** **4) a designated beach?**	**Do the pollutant(s)** **1) threaten human health and/or** **2) pose a threat to Federally listed threatened or endangered species?**	**Preliminary water resource based TMDL priority rank**
Yes	Yes	High
No	Yes	High
Yes	No	Medium
No	No	Low

Table 3-14: Final TMDL priority ranking

Preliminary water resource based TMDL priority rank (from Table 3-13)	Is there a substantial amount of public interest and support?	Are there adequate resources available to conduct the TMDL?	Are there other administrative or legal factors (i.e., the need to support the NPDES program or a court order) that require the TMDL to be completed in the near future?	Is it very likely that the TMDL, once developed, can or will be implemented (is it technologically possible and economically feasible)?	Final TMDL priority rank
High, Medium or Low	-	Yes	Yes	-	High
High, Medium or Low	-	No	Yes	-	Low
High	-	Yes	No	Yes	High
High	Yes	Yes	No	No	Medium
High	Yes	No	No	No	Low
High	No	-	No	No	Low
Medium	Yes	Yes	No	Yes	High
Medium	Yes	Yes	No	No	Medium
Medium	No	Yes	No	Yes	Medium
Medium	Yes	No	No	No	Low
Medium	No	-	No	No	Low
Low	Yes	Yes	No	Yes	High
Low	No	Yes	No	Yes	Medium
Low	No	Yes	No	No	Low
Low	Yes	No	No	No	Low
Low	No	-	No	No	Low

Note: "-" means Yes or No.

3.1.26 Probabilistic Assessments

One of the goals of Section 305(b) of the CWA is to assess all surface waters. To assess a large population such as surface waters, there are two generally accepted data collection schemes. The first is a census which requires examination of every unit in the population. This, however, is usually very expensive and often impractical.

A more practical and economic approach is to conduct a sample survey which involves sampling a portion of the population through probability (or random) sampling. Random sampling ensures that no particular portion of the population being sampled is favored (or biased) over another. Results of sample surveys can be used to make statistically based inferences (i.e., probabilistic assessments) about the condition of the

population as a whole. For example, if a sample survey was conducted on lakes and 30% of the random samples indicated aquatic life use impairment, it could be stated that 30% of the all lakes were impaired for aquatic life. Another benefit of sample surveys is that statistical analyses can also be conducted to determine the margin of error or confidence limits in the assessment.

Probabilistic assessments are most useful for Section 305(b) reporting purposes because they can provide a general overall idea of the condition of an entire waterbody type (i.e., all rivers or lakes) which might otherwise be impossible to do using the census approach. General rules for conducting and using probabilistic assessments for surface water quality assessments in New Hampshire, include the following.

- Probability assessments shall be conducted in accordance with accepted statistical practices.
- Sampling shall be based on a random sampling design.
- Sample surveys should be designed to produce 95% confidence limits on the percent of the resource (e.g., all lakes) in any use support category (e.g., fully supporting, not supporting, etc.) of no more than +/- 20%.
- Criteria for determining use support shall be in accordance with this document with the exception of the minimum number of samples required. That is, when conducting probabilistic assessments, each random sample can, by itself, be used to make a discrete use support decision.
- The percentage of discrete random samples meeting each use support category can be used as an estimate of the percentage of the resource meeting each use support category. For example, if 20% of the discrete random samples taken in lakes indicate full support of aquatic life, then it can be reported that 20% of the lakes fully support aquatic life.
- Probabilistic assessment results shall have no bearing on the Section 303(d) List other than the fact that samples collected for the probabilistic assessment can be combined with other samples within an assessment unit (AU) and assessed in accordance with this document (including the minimum sample size) to determine if the AU should be included on the Section 303(d) List.

For this cycle a probabilistic assessment was conducted for the estuaries. Results and details of this assessment may be found in NHDES, 2004c.

3.2 ASSESSMENT CRITERIA BY DESIGNATED USE

3.2.1 Overview

The following tables provide specific assessment criteria for each of the seven designated uses. Each table includes a definition of the use, the applicable surface waters, the core indicators for the use, and detailed assessment criteria for various parameters of water quality pertinent to the use, including criteria for the core indicators. This assessment criteria is supplemental to the general assessment criteria provided in Section 3.1.

3.2.2 Use: Primary Contact Recreation

Definition: Waters that are suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water**.**

Applicability: All surface waters

Core Indicator(s): Bacteria (Pathogens)

Assessment Criteria: **The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.**

Indicator 1: **Beach closures or restrictions (for designated beaches only)**

FS: There were no known beach closures or restrictions in effect during the reporting period and, if there were any beach closures in the previous reporting period, there is sufficient evidence indicating that the cause of the beach closures has been abated.

NS: There was one or more bathing area closures or restrictions during the reporting period, or there were beach closures in previous reporting periods but insufficient evidence to indicate that the cause of the beach closures in the past has been abated.

Notes:

1. Bathing area closures or restrictions shall be based on annual bacteria sampling performed by the DES Beach Program at fresh water and tidal waters beaches or to the presence of cyanobacteria blooms in the beach area (NHDES, 2003f). If beach program criteria are exceeded, DES advises the beach owner to post the beach. Such advisories are considered “restrictions” for assessment purposes.
2. If a beach on a lake was posted because of cyanobacteria, the entire lake (including the beach area) were assessed as impaired because of the ability of cyanobacteria scums to spread from wind and wave action.

Indicator 2: **Bacteria (pathogens)**

FS: See criteria presented in table 3-15.

NS: See criteria presented in table 3-15.

Primary Contact Recreation (continued)

Table 3-15: Use Support Matrix for Bacteria (Primary Contact Recreation)

May 24 – September 15 (Critical Period)				September 16 - May 23				Use Support
Geometric Mean (GM)		Single Samples (SS)		Geometric Mean (GM)		Single Samples (SS)		
# of GM Calculations	Results	# SS	Results	# of GM Calculations	Results	# SS	Results	
≥ 1	< GMC	≥ 0	< SSMC	≥ 0	< GMC	≥ 0	< SSMC	FS
≥ 0	< GMC	≥ 2	< 75% of GMC					
0		≤ 1	< SSMC	≥ 0	< GMC	≥ 0	< SSMC	INSUFFICIENT INFORMATION or NOT ASSESSED
0		≥ 2 and ≥ 1	< SSMC ≥ 75% GMC but < SSMC					
0 exceedances of the GMC and only 1 exceedance of the SSMC								
≥ 1 exceedance of the GMC and/or ≥ 2 exceedances of the SSMC								NS

Notes:

1. Water Quality Criteria (WQC)

Waterbody Type	Bacteria	Geometric Mean Criteria (GMC)	75% of GMC	Single Sample Maximum Criteria (SSMC)
Class A Fresh water	Escherichia coli	47	35	153
Class B Fresh water	Escherichia coli	126	95	406
Class B Tidal water	Enterococci	35	26	104

2. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-14 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

3. As indicated in Table 3-15, to be FS, there must be sufficient data to make an assessment during the peak contact recreation season (May 24 to September 15).

Primary Contact Recreation (continued)

4. Calculation of the geometric mean (GM) shall be based on
   a. a rolling average and
   b. at least 3 independent samples collected within 60 consecutive days at the same station, but on different days, or
   c. at least 3 independent samples collected within 60 consecutive days from different stations within the Assessment Unit provided that at least 2 of the samples are separated by a period of at least 2 days.

5. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 3: Discharges of Untreated Sewage

FS: There are no known discharges of untreated sewage.

NS: There are known or highly suspected discharges of untreated sewage.

Notes:

1. The primary pollutant of concern in untreated sewage is bacteria (pathogens).

2. Examples of sources of untreated sewage discharges include connections of sanitary sewer pipes to storm drains (i.e., illicit connections), combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and failing septic systems that discharge to surface waters.

3. Evidence of suspected discharges of untreated sewage include physical evidence (feces, toilet paper, etc.), odors of sewage, chemical evidence (i.e., chlorine or elevated levels of ammonia in a pipe) and / or elevated bacteria concentrations in the pipe.

4. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 4: Chlorophyll a (chlor a)

FS: See criteria presented in table 3-15.

NS: See criteria presented in table 3-15.

Primary Contact Recreation (continued)

Table 3-16: Use Support Matrix for Chlor a

May 24 – September 15 (Critical Period) Sample Size	September 16 - May 23 Sample Size	Total Sample Size	Total # WQC Exceedances	Total # of MAGEXC Exceedances	Use Support
≥ 10	≥ 0	≥ 10	< # exceedances shown on the table 3-10 for the total sample size	≤1	FS
		< 10	< 3	≤ 1	INSUFFICIENT INFORMATION or NOT ASSESSED
< 10	≥ 1	≥ 10	< # exceedances shown on table 3-10 for the total sample size	≤ 1	
		≤ 10	≥ 3	≥ 0	NS
		> 10	≥ # exceedances shown on table 3-10 for the total sample size	≥ 0	
		≥ 2	≥ 2	≥ 2	

Notes:

1. Assessments using chlor a concentrations shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-16 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

2. Exceedances of the water quality criteria (WQC) are defined as:

   Freshwater: Chlor a ≥ 15 ppb (NHDES, 2003c)
   Tidal Waters: Chlor a ≥ 20 ppb (NHDES, 2003d)

3. Exceedances of the Magnitude of Exceedance Criteria (MAGEXC) for chlor a are defined as:

   Freshwater: Chlor a ≥ 30 ppb
   Tidal Waters: Chlor a ≥ 40 ppb

Primary Contact Recreation (continued)

4. As indicated in Table 3-16, to be FS, there must be sufficient data to make an assessment during the peak contact recreation season (May 24 to September 15).

5. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 5: Color, foam, debris, scum, slicks, odors, surface floating solids

FS: The surface water does not contain color, foam, debris, scum, slicks, odors, and/or surface floating solids in amounts and for durations that significantly interfere with the primary contact recreational use, unless naturally occurring.

NS: The surface water contains color, foam, debris, scum, slicks, odors and/or surface floating solids in significant amounts and for durations that significantly interfere with the primary contact recreational use, and they are not naturally occurring.

Notes:

1. It is not the intent of this indicator to assess a surface water as impaired for an occasional case of litter or debris. Rather this indicator is intended to address more significant, chronic cases of pollution.

2. This indicator can be used for iron hydroxide deposits due to iron in groundwater from landfills that produce objectionable scums of iron hydroxide floc and taint the water orange.

3. See Section 3.1.23 for determining waters that should be placed in Category 5.

3.2.3 Use: Secondary Contact Recreation

Definition: Waters that support recreational uses that involve incidental contact with the water

Applicability: All surface waters

Core Indicator(s): Bacteria (Pathogens)

Assessment Criteria: **The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.**

Indicator 1: **Bacteria (pathogens)**

FS: See criteria presented in table 3-17.

NS: See criteria presented in table 3-17.

Table 3-17: Use Support Matrix for Bacteria (Secondary Contact Recreation)

May 24 – September 15 (Critical Period)				September 16 - May 23				Use Support
Geometric Mean (GM)		Single Samples (SS)		Geometric Mean (GM)		Single Samples (SS)		
# of GM Calculations	Results	# SS	Results	# of GM Calculations	Results	# SS	Results	
≥ 1	< GMC	≥ 0	< SSMC	≥ 0	< GMC	≥ 0	< SSMC	FS
≥ 0	< GMC	≥ 2	< 75% of GMC					
0		≤ 1	< SSMC	≥ 0	< GMC	≥ 0	< SSMC	INSUFFICIENT INFORMATION or NOT ASSESSED
0		≥ 2 and ≥ 1	< SSMC ≥ 75% GMC but < SSMC					
0 exceedances of the GMC and only 1 exceedance of the SSMC								
≥ 1 exceedance of the GMC and/or ≥ 2 exceedances of the SSMC								NS

Secondary Contact Recreation (continued)

Notes:

1. Water Quality Criteria

	Bacteria	Geometric Mean Criteria (GMC)	75% of GMC	Single Sample Maximum Criteria (SSMC)
Class A Fresh water	Escherichia coli	235	176	765
Class B Fresh water	Escherichia coli	630	473	2030
Class B Tidal water	Enterococci	175	131	520

2. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-17 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

3. As indicated in Table 3-17, to be FS, there must be sufficient data to make an assessment during the peak contact recreation season (May 24 to September 15).

4. Calculation of the geometric mean (GM) shall be based on

   a. a rolling average and
   b. at least 3 independent samples collected within 60 consecutive days at the same station, or
   c. at least 3 independent samples collected within 60 consecutive days from different stations within the Assessment Unit provided that at least 2 of the samples are separated by a period of at least 2 days.

5. See Section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 2: Discharges of Untreated Sewage

FS: There are no known discharges of untreated sewage.

NS: There are known or highly suspected discharges of untreated sewage.

Notes:

1. The primary pollutant of concern in untreated sewage is bacteria (pathogens).

2. Examples of sources of untreated sewage discharges include connections of sanitary sewer pipes to storm drains (i.e., illicit connections), combined sewer overflows (CSOs), sanitary sewer overflows (SSOs) and failing septic systems that discharge to surface waters.

Secondary Contact Recreation (continued)

3. Evidence of suspected discharges of untreated sewage include physical evidence (feces, toilet paper, etc.), odors of sewage, chemical evidence (i.e., chlorine or elevated levels of ammonia in a pipe) and / or elevated bacteria concentrations in the pipe.

4. See Section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 3: Obstructions to Boating (Navigation)

FS: Navigational channels normally used for boating have not been unintentionally filled in as a result of human activity such that passage of boats is now obstructed.

NS: Navigational channels normally used for boating have been unintentionally filled in as a result of human activity such that passage of boats is now obstructed.

Notes:

1. See Section 3.1.23 for determining waters that should be placed in Category 5.

3.2.4 Use: Aquatic Life

Definition: Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.

Applicability: All surface waters

Core Indicator(s):

Core Indicator(s)	Applicable Surface Waters
Biological based on benthic macroinvertebrates	Rivers/Streams and associated impoundments $\leq 4^{th}$ order
Biological based on at least 2 assemblages (fish and benthic macroinvertebrates) or a minimum of dissolved oxygen, pH and documentation by a water quality professional trained in biology that there is no obvious impairment to the biological community	All other surface waters (fresh and tidal)

Assessment Criteria: **The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.**

Indicator 1: **Dissolved Oxygen (DO)**

FS: See criteria presented in table 3-18.

NS: See criteria presented in table 3-18.

Aquatic Life (continued)

Table 3-18: Use Support Matrix for Dissolved Oxygen

Total Sample Size	Total # WQC Exceedances	Total # of MAGEXC Exceedances	Use Support
≥ 10	< # shown table 3-11 for the total sample size	≤ 1	FS
< 10	< 3	1	INSUFFICIENT INFORMATION or NOT ASSESSED
< 10	≥ 3	≥ 0	NS
≥ 10	≥ # shown on table 3-11 for the total sample size	≥ 0	
≥ 2	≥ 2	≥ 2	

Notes:

1. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-18 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

2. To be assessed as FS for dissolved oxygen:

   a. There must be sufficient data to indicate that all appropriate DO criteria are met (i.e., instantaneous minimum, daily average and in some cases, the 7 day mean as well).

   b. Samples must be taken during critical times and seasons depending on the water type and use:

      - If the surface water is not a cold water natural reproducing fishery), at least 50% of the minimum number of independent samples needed for FS, shall be taken between June 1 and September 30. This is when DO is most apt to be lowest due to high temperatures and low flows.

      - In surface waters that are cold water natural reproducing fisheries, 100 % of the minimum number of independent samples needed for FS determination shall be taken between October 1 and May 14

Aquatic Life (continued)

3. Exceedances of the Water Quality Criteria for DO are defined as:

Applicable waters	Daily Average Measurement	Instantaneous Measurement
Class A: Applies to any depth	< 75% saturation	< 6 mg/L
Class B: Applies to any depth in free flowing rivers and tidal waters and in the epilimnion (if stratified) or in the top 25% of depth (if not stratified) in lakes, ponds, impoundments and reservoirs. Note that DO in lower depths of lakes, ponds impoundments and reservoirs must support existing and designated uses. .	< 75% saturation	< 5 mg/L
Class A or B cold water fish spawning areas whose early life stages are not directly exposed to the water (i.e., cold water naturally reproducing fisheries). Applies to any depth in free flowing rivers and tidal waters and in the epilimnion (if stratified) or in the top 25% of depth (if not stratified) in lakes, ponds, impoundments and reservoirs.	From 10/1 to 5/14, a 7 day mean DO based on the daily average of < 9.5 mg/L	From 10/1 to 5/14 DO < 8 mg/L

4. Exceedances of the Magnitude of Exceedance Criteria (MAGEXC) for DO are defined as:

$$DO \leq 4.0 \text{ mg/L}$$

5. Data requirements for determining compliance:

   a Where DO is used as a Core Indicator, there must be sufficient data to indicate that all appropriate DO criteria are met (i.e., instantaneous minimum, daily average and in some cases, the 7 day mean as well) before DO can be assessed attaining water quality standards

   b Preferred data/conditions for assessing DO:

      1) Compliance with instantaneous minimum DO criteria shall be based on the minimum of a series of dissolved oxygen measurements taken at the same location and a maximum of one hour apart for 24 continuous hours except as noted in 5c below.

Aquatic Life (continued)

2) Compliance with average daily DO criteria, shall be based on the time weighted average of DO measurements taken at the same location and a maximum of one hour apart for 24 continuous hours except as noted in Note 5c below.

c Other allowable data/conditions for assessing DO:

1) For lakes and ponds:

a. If preferred data is not available (see Note 5b), a lake may be assessed for compliance with DO criteria, provided that samples are based on a profile taken between 10:00 and 14:00 in the average epilimnetic or upper 25% of depth for stratified and unstratified lakes respectively.
b. (Source: NHDES, 2003b)

Alternative DO Assessment Criteria for Lakes/Ponds

Use Support	DO
FS	≥ 6 mg/L and ≥ 85% saturation
Insufficient Information	≥ 5 mg/L but < 6 mg/L and/or ≥ 75% saturation but < 85% saturation
NS	< 5 mg/L or < 75% saturation

2) For rivers/streams and impoundments:

a. If preferred data is not available (see Note 5b), rivers/streams and impoundments may be assessed for compliance with the instantaneous minimum and MAGEXC DO criterion based on grab sample taken between 05:00 and 08:00.
b. If preferred data is not available (see Note 5b), rivers/streams and impoundments may be assessed for compliance with the 75% average daily saturation DO criterion based on a single sample as shown below, provided that samples are taken within the specified times shown.
c. Source: NHDES, 2003g.

Aquatic Life (continued)

Alternative % Saturation DO Assessment Criteria for Rivers / Streams and Impoundments

Use Support	Time of Single Sample	DO (% saturation)
FS	05:00 – 10:00 or 14:00 – 19:00	≥ 80% saturation or ≥ 100% saturation
Insufficient Information	05:00 – 10:00 or 14:00 – 19:00	> 45% but < 80 % or > 70% but < 100 %
NS	05:00 – 10:00 or 14:00 – 19:00	≤ 45% saturation or ≤ 70% saturation

3) For tidal waters:
   a. If preferred data is not available (see Note 5b), tidal waters may be assessed for compliance with the instantaneous minimum and MAGEXC DO criteria based on at grab samples taken at high and low tide.
   b. If preferred data is not available (see Note 5b), tidal waters may be assessed for compliance with the 75% average daily saturation DO criteria based on the average of 2 grab samples as shown below, provided that the samples are taken at concurrent high and low tides.
   c. Source: NHDES, 2004a.

Alternative % Saturation DO Compliance Criteria for Tidal Waters

Use Support	DO (% saturation)
FS	> 80%
Insufficient Information	≥ 65% but ≤ 80%
NS	< 65%

Aquatic Life (continued)

6. Each daily average calculation is an independent sample for comparison to daily average criteria. Each 7 day mean calculation is considered an independent sample for comparison to 7 day mean criteria. For comparison to the instantaneous minimum or MAGEX criteria, independent samples shall be those taken on different calendar days. If more than one sample is taken on a given calendar day, the worse case sample will be the independent sample for that day. If there are multiple vertical profile measurements at a station, the lowest measurement shall be the independent sample for that day.

7. See Section 3.1.23 for determining waters that should be placed in Category 5

Indicator 2: pH

FS: See criteria presented in table 3-19.

NS: See criteria presented in table 3-19.

Table 3-19: Use Support Matrix for pH

Total Sample Size	Total # WQC Exceedances	Total # of MAGEXC Exceedances	Use Support
≥ 10	< # shown table 3-11 for the total sample size	≤1	FS
< 10	< 3	1	INSUFFICIENT INFORMATION or NOT ASSESSED
< 10	≥ 3	≥ 0	NS
≥ 10	≥ # shown table 3-11 for the total sample size	≥ 0	NS
≥ 2	2	2	NS

Notes:

1. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-19 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

2. Exceedances of the Water Quality Criteria (WQC) for pH are defined as:

$$pH < 6.5 \quad \text{or} \quad pH > 8.0$$

3. Exceedances of the Magnitude of Exceedance Criteria (MAGEXC) for pH are defined as:

$$pH < 5.5 \quad \text{or} \quad pH > 9.0$$

Aquatic Life (continued)

4. Absent other sources that could significantly impact pH, low pH exceedances in waters with apparent color measurements greater than 30 cpu were considered due to natural sources such as natural tannic and humic acids in the water. In tidal waters, pH exceedances greater than 8.0, but less than or equal to 8.5, were considered natural unless there was evidence to suggest that the source was due to human activity (NHDES, 2003e). As discussed in Section 3.1.6, such naturally occurring exceedances were flagged as "Observed Effects" in the ADB.

5. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 3: Biological Assessments – Benthic Index of Biological Integrity

FS: See criteria presented in table 3-20.

NS: See criteria presented in table 3-20.

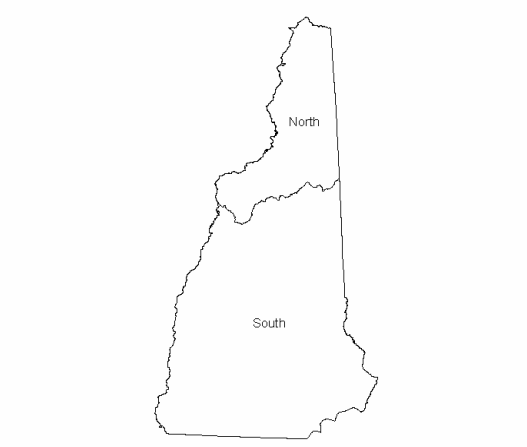
Table 3-20: Use Support Matrix for Benthic Index of Biologic Integrity.

Benthic Index of Biologic Integrity	Bioregion	Use Support
≥ 67	North	FS
< 67	North	NS
≥ 45	South	FS
< 45	South	NS

Notes:

1. Bioregion defines distinct biological community types. Boundaries for the "Northern" and "Southern" bioregions represent similar Ecological Drainage Units as defined by The Nature Conservancy. Similarity among Ecological Drainage Units was determined from invertebrate presence / absence data using non-metric multidimensional scaling ordination procedures.

Aquatic Life (continued)



2. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-19 and must include biomonitoring data collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

3. Assessments shall be based on data collected in accordance with DES biomonitoring protocols, which include the deployment and collection of rock baskets during the summer months. A description of the DES biomonitoring program may be found in the 2000 305(b) Report (NHDES, 2000).

4. Scores for the Benthic Index of Biologic Integrity represent an average of 8 biologic "metrics" that include total taxonomic richness, stonefly (Order Plecoptera) taxonomic richness, percent "collector-filterer" individuals normalized by watershed area, percent midge (Family Chironomidae) individuals, percent "clinger" individuals, percent "intolerant" individuals, and "tolerant" taxa richness. The criterion for determining use support status was defined as the 25th percentile of the bioregional reference condition.

5. NH is in the process of developing numeric biomonitoring water quality standards for wadable streams. The methodology described above for determining use support is considered an interim numeric interpretation of the state's narrative standard. It is possible the interpretation may change in the future during the adoption of water quality standards

6. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 4: Habitat Assessments

FS: See criteria presented in table 3-21.

NS: See criteria presented in table 3-21.

Aquatic Life (continued)

Table 3-21: Use Support Matrix for Habitat Assessment Score

Habitat Assessment Score	Use Support
≤ 10 for no more than one parameter and biological assessment supports the designation	FS
≤ 10 for more than one parameter and biological assessment was assigned NS status	NS
≤ 10 for more than one parameter and biological assessment was assigned FS status	Insufficient Information
≤ 10 for more than one parameter and biological assessment supports the designation	NS

Notes:

1. Habitat information for habitat scoring is collected when bioassessments are conducted. Data is based on visual observations using standard protocols and assessment sheets that address ten specific habitat parameters for low and high gradient streams. Habitat parameters include epiphaunal substrate/available cover, pool substrate characterization, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuousity, bank stability, vegetative protection, and riparian vegetative zone width. Each parameter was then given a score from one to twenty. These values were then compared to Table 3-21 to determine use support.

2. A FS habitat score is indicative of naturally occurring stream morphology, substrate composition, natural riparian physical and vegetative structure and stability, flow regime and minimal to no anthropogenic influences within a spatial range that could induce stressed or impaired habitat conditions.

3. A NS habitat score is indicative of obvious non-naturally occurring influences that are considered marginal to severe.

4. An insufficient information determination is given in cases where clear evidence of non-naturally occurring influences have degraded habitat but biological assessment does not indicate impairment.

5. A NS biological assessment is given priority over a FS habitat assessment in making a final NS use determination as non-habitat related factors could influence aquatic life use suitability.

6. In some instances best professional judgement (BPJ) was used in making an “insufficient information” use support determination. BPJ use determination was only used when clear evidence of natural abiotic variables were believed to limit overall biologic integrity.

7. In cases were habitat data were unavailable, use determination was based solely on the biologic assessment.

8. As discussed in section 3.1.5 and 3.1.23, habitat is considered a nonpollutant; consequently waters impaired solely because of habitat will not be placed in Category 5.

Aquatic Life (continued)

Indicator 5: Water Quality Criteria for Toxic Substances in the Ambient Water

FS: See criteria presented in table 3-22.

NS: See criteria presented in table 3-22.

Table 3-22: Use Support Matrix for Toxic Substances

Total Sample Size	Total # WQC Exceedances	Total # of MAGEXC Exceedances	Use Support
≥ 10	< # shown table 3-11 for the total sample size	≤1	FS
< 10	< 3	1	INSUFFICIENT INFORMATION or NOT ASSESSED
< 10	≥ 3	≥ 0	NS
≥ 10	≥ # shown table 3-11 for the total sample size	≥ 0	NS
≥ 2	2	2	NS (for acute criteria only)

Notes:

1. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-22 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

2. Acute and chronic Water Quality Criteria (WQC) for chemical specific toxic substances in the water column may be found in the State's surface water quality regulations (NHDES, 1999), Table 1703.1 of Env-Ws1703.21. These criteria shall be used for determining compliance if clean techniques equivelant to EPA Method 1669 (USEPA, 1995) were used for sampling and analysis. If clean techniques were not used, see Note 4.

3. Exceedances of the Magnitude of Exceedance Criteria (MAGEXC) for chemical specific toxic substances in the water column are defined as

   ≥ 2 times the acute WQC
   (see Note 4 if clean techniques for sampling and/or analysis were not used.)

Aquatic Life (continued)

4. If clean techniques equivelant to EPA Method 1669 (USEPA, 1995) were NOT used for sampling and/or analysis, WQC for determining NS shall be in accordance with the criteria shown in tables 3-23 and 3-24 below for total and dissolved metals respectively. These tables account for moderate levels of contamination (i.e. the Contamination Concentration) that are likely to occur when clean techniques are not implemented. The values shown are for a hardness of 25 mg/L or less. For waters with hardness greater than 25 mg/L, the WQC for determining NS shall be equal to the sum of the adjusted WQC from the state's surface water quality regulations (NHDES, 1999) plus the Contamination Concentration shown in the tables below. Information supporting these criteria may be found in NHDES, 2003a.

Table 3-23: Total Metals – WQC for Determining NS without Clean Techniques

TOTAL METALS									
Metal	WQC for determining impairment (NS) if clean techniques are used *				Contamination Concentration	WQC for determining impairment (NS) if clean techniques are NOT used *			
	Acute-Fresh	Chronic-Fresh	Acute-Marine	Chronic-Marine		Acute-Fresh	Chronic-Fresh	Acute-Marine	Chronic-Marine
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	750.00	87.00	NC	NC	20.00	770.0	107.0	NC	NC
Antimony	9000.0 0	1600.00	NC	NC	20.00	9020.0	1620.0	NC	NC
Arsenic	340.00	150.00	69.00	36.00	20.00	360.0	170.0	89.0	56.0
Beryllium	130.00	5.30	NC	NC	20.00	150.0	25.3	NC	NC
Cadmium	0.95	0.83	42.20	9.40	7.46	8.4	8.3	49.7	16.9
Chromium (Total)	595.62	39.12	11408. 00	NC	19.56	615.2	58.7	11427.6	NC
Chromium +3	579.32	27.69	10300. 00	NC	13.84	593.2	41.5	10313.8	NC
Chromium +6	16.29	11.43	1108.0 0	50.10	5.72	22.0	17.2	1113.7	55.8
Copper	3.79	2.85	5.80	3.70	12.84	16.6	15.7	18.6	16.5
Lead	13.98	0.54	220.00	8.50	4.25	18.2	4.8	224.3	12.8
Mercury	1.65	0.91	2.12	1.11	17.21	18.9	18.1	19.3	18.3
Nickel	145.21	16.14	74.70	8.30	4.15	149.4	20.3	78.9	12.5
Selenium	NC	5.00	290.50	71.10	20.00	NC	25.0	310.5	91.1
Silver	0.37	NC	2.24	NC	2.24	2.6	NC	4.5	NC
Thallium	1400.0 0	40.00	2130.0 0	NC	20.00	1420.0	60.0	2150.0	NC
Zinc	37.02	37.02	95.10	85.60	37.02	74.0	74.0	132.1	122.6

*Values are based on a hardness of $\leq$ 25 mg/L.

Aquatic Life (continued)

Table 3-24: Dissolved Metals – WQC for Determining NS without Clean Techniques

DISSOLVED METALS									
Metal	Contamination Concentration	WQC for determining impairment (NS) if clean techniques are used *				WQC for determining impairment (NS) if clean techniques are NOT used *			
		Acute-Fresh	Chronic-Fresh	Acute-Marine	Chronic-Marine	Acute-Fresh	Chronic-Fresh	Acute-Marine	Chronic-Marine
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	20.00	750.00	87.00	NC	NC	770.0	107.0	NC	NC
Antimony	20.00	9000.00	1600.00	NC	NC	9020.0	1620.0	NC	NC
Arsenic	20.00	340.00	150.00	69.00	36.00	360.0	170.0	89.0	56.0
Beryllium	20.00	130.00	5.30	NC	NC	150.0	25.3	NC	NC
Cadmium	7.46	0.95	0.80	41.95	9.34	8.4	8.3	49.4	16.8
Chromium (Total)	19.56	199.07	34.81	11400.24	NC	218.6	54.4	11419.8	NC
Chromium +3	13.84	183.07	23.81	10300.00	NC	196.9	37.7	10313.8	NC
Chromium +6	5.72	16.00	11.00	1100.24	49.75	21.7	16.7	1106.0	55.5
Copper	12.84	3.64	2.74	4.81	3.07	16.5	15.6	17.7	15.9
Lead	4.25	13.88	0.54	209.22	8.08	18.1	4.8	213.5	12.3
Mercury	17.21	1.40	0.77	1.80	0.94	18.6	18.0	19.0	18.2
Nickel	4.15	144.92	16.10	73.95	8.22	149.1	20.2	78.1	12.4
Selenium	20.00	NC	4.61	289.92	70.96	NC	24.6	309.9	91.0
Silver	2.24	0.32	NC	1.90	NC	2.6	NC	4.1	NC
Thallium	20.00	1400.00	40.00	2130.00	NC	1420.0	60.0	2150.0	NC
Zinc	37.02	36.20	36.50	89.96	80.98	73.2	73.5	127.0	118.0

*Values are based on a hardness of $\leq$ 25 mg/L.

Indicator 6: Toxicity Tests of the Ambient Water

FS: See criteria presented in table 3-25.

NS: See criteria presented in table 3-25.

Table 3-25: Use Support Matrix for Toxicity Tests

Total Sample Size	Total # Acute and/or chronic toxicity tests indicating toxicity	Use Support
$\geq$ 10	< # shown in table 3-11 for the total sample size	FS
< 10	< 3	INSUFFICIENT INFORMATION or NOT ASSESSED
< 10	$\geq$ 3	NS
$\geq$ 10	$\geq$ # shown in table 3-11 for the total sample size	NS
$\geq$ 2	2	NS (for acute criteria only)

Aquatic Life (continued)

Notes:

1. Assessments shall be based on the most recent full calendar year of data (or years if there was insufficient data in the most recent year to make an assessment). If, however, older data indicated NS, the more recent data used to make a FS decision must meet the requirements in Table 3-23 and must include at least 2 samples collected in the same general area and under similar conditions (i.e., wet weather, dry weather, season, etc) as when the older exceedances occurred.

2. Acute and chronic toxicity tests shall be in accordance with the EPA protocols.

3. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 7: Sediment Quality

FS: See criteria presented in table 3-26.

NS: See criteria presented in table 3-26.

Table 3-26: Use Support Matrix for Sediment Quality

Sediment Chemistry		**Sediment toxicity bioassays**			**Sediment biological community survey**		**Impairment determination**
Sediment Chemistry Sample Size	Number of samples that are "high priority" (e.g., HQ-PEC>1)?	Has sediment characterization proceeded to next step within 2 years of sampling?	Bioassay Sample Size	Number of bioassay samples that fail the toxicity test (i.e., acute or chronic impacts of >20%)	Has characterization proceeded to next step within 2 years of sampling?	Do benthic biological survey results indicate impairment as compared to a reference site(s)?	
≥2	0	No	0	Not measured	No	Not measured	FS
≥2	1	No	0	Not measured	No	Not measured	II
≥2	1	Yes	1	0	No	Not measured	FS
≥2	1	Yes	1	1	No	Not measured	II
≥2	≥2	No	0	Not measured	No	Not measured	II
≥2	1	Yes	≥2	1	No	Not measured	FS
≥2	≥2	Yes	≥2	<2	Yes	No	FS-WOE*
≥2	≥2	Yes	≥2	≥2	Yes	No	FS-WOE*
≥2	≥2	Yes	≥2	≥2	No	Not measured	NS
≥2	≥2	Yes	≥2	≥2	Yes	Yes	NS
≥2	≥2	Yes	≥2	<2	Yes	Yes	NS-WOE*
≥2	≥2	No	0	Not measured	No	Not measured	NS
<2	<2	Yes	<2	<2	No	Not measured	II
<2	<2	Yes	≥2	≥2	No	Not measured	NS
<2	<2	Yes	≥2	≥2	Yes	Yes	NS-WOE*
<2	<2	Yes	≥2	≥2	Yes	No	FS-WOE*
<2	<2	No	0	Not measured	Yes	Yes	NS-WOE*

* WOE stands for Weight of Evidence - see Note 2.

Aquatic Life (continued)

Notes:

1. Use support criteria shown in Table 3-26 are based on the sediment quality triad approach (NHDES, 2004b).

2. Impairment determinations in Table 3-26 with a trailing "WOE" indicate that the determination will be made based on the weight of evidence provided by the sediment chemistry, sediment toxicity, and benthic community data. The impairment determination listed for each of these rows is the likely determination but it can be changed to another if the weight of evidence indicates otherwise. This flexibility was added to allow the analyst to account for inappropriate toxicity tests, inconclusive benthic community tests, extremely high sediment chemistry concentrations, and other factors that would affect the impairment determination.

3. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 8: Exotic Macrophytes

FS: There are no known communities of exotic macrophytes present in the surface water.

NS: Exotic macrophytes are present in the surface water.

Notes:

1. Exotic macrophytes are non-native, fast growing aquatic plants, which can quickly dominate and choke out native aquatic plant growth in the surface water. Examples of exotic macrophytes include variable milfoil (Myriophyllum heterophyllum), Eurasian milfoil (Myriophyllum spicatum), fanwort (Cabomba caroliniana) and water chestnut (Trapa natans). Such infestations are in violation of Env-Ws 1703.19, which states that surface waters shall support and maintain a balanced, integrated and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of a region.

2. As discussed in section 3.1.6, exotic macrophytes are considered nonpollutants. Consequently waters impaired by exotic macrophytes will not be placed in Category 5.

Indicator 9: Flow

FS: There is no documented evidence that non-naturally occurring flows were less than the Aquatic Base Flow (ABF), or less than minimum flow requirements established by DES through the Section 401 Water Quality Certification Program over the past 2 years.

NS: There is documented evidence that there have been 2 or more instances over the last 2 years where, of non-naturally occurring flows that were less than the ABF or less than minimum flow requirements established by DES through the Section 401 Water Quality Certification Program.

Aquatic Life (continued)

Notes:

1. Determination of the Aquatic Base Flow shall be in accordance with the United States Fish and Wildlife Service "Interim Policy for New England Streams Flow Recommendations" (USFWS, 1981).

2. Section 401 Water Quality Certifications must be obtained from DES for any project requiring a federal permit or license. This includes most wetland dredge or fill projects as well as Federal Energy Regulatory Commission (FERC) projects (i.e., hydropower projects). As part of this process, DES has the obligation to establish conditions to ensure that the construction and operation of the project will not result in violations of water quality standards. This includes establishment of flow conditions where necessary to ensure that aquatic life is not adversely impacted.

3. As discussed in section 3.1.5 and 3.1.23, flow is considered a nonpollutant; consequently waters impaired by flow, will not be placed in Category 5.

Indicator 10: Benthic Deposits

FS: Benthic deposits are not present in amounts sufficient to have a significant detrimental effect on the benthic community, other than those that are naturally occurring.

NS: Significant benthic deposits exist which are causing an obvious detrimental impact to the benthic community and, are not naturally occurring.

Notes:

1. Examples of NS for this indicator include major sediment deposits resulting from significant erosion and major iron hydroxide deposits due to increased iron levels in groundwater from landfills.

2. See section 3.1.23 for determining waters that should be placed in Category 5.

3.2.5 Use: Drinking Water After Adequate Treatment

Definition: Waters that with conventional treatment will be suitable for human intake and meet state/federal drinking water regulations.

Applicability: All fresh surface waters

Core Indicator(s):

For existing drinking water supplies:

Compliance with Safe Drinking Water Act (SDWA) standards in the Finished Drinking Water

Finished Drinking Water Restrictions

Contaminants in source water that require more than convention

For all other fresh surface waters:

Core indicators are under development. For this assessment cycle, all fresh surface waters that are not currently used as drinking water supplies were assigned a use support of "Insufficient Information" or "Not Assessed" for this use.

Assessment Criteria: The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.

Indicator 1: Compliance with Safe Drinking Water Act (SDWA) standards in the Finished Drinking Water

FS: The water treatment facility is not in significant non-compliance (as defined by EPA) of Safe Drinking Water Act (SDWA) standards in the finished drinking water that are directly attributable to non-naturally occurring constituents in the source water that cannot be removed by conventional treatment.

NS: The water treatment facility is in significant non-compliance (as defined by EPA) of Safe Drinking Water Act (SDWA) standards in the finished drinking water that are directly attributable to non-naturally occurring constituents in the source water that cannot be removed by conventional treatment.

Notes:

1. Existing drinking water supply assessments are based on information provided by the DES Water Supply Engineering Bureau.

Indicator 2: Finished Drinking Water Restrictions (existing drinking water supplies only)

FS: There have been no source water closures or advisories that have lasted more than 30 days per year over the past 2 years.

Drinking Water After Adequate Treatment (continued)

NS: Over the past 2 years, there have been one or more drinking water source advisories lasting more than 30 days per year or one or more closures per year.

Notes:

1. Existing drinking water supply assessments are based on information provided by the DES Water Supply Engineering Bureau.

2. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 3: Contaminants in source water that require more than conventional treatment (existing drinking water supplies only)

FS: No source waters have required more than conventional treatment over the past 2 years to enable drinking water uses.

NS: Over the past 2 years, or one or more source waters have required more than conventional treatment to enable drinking water uses due to contaminants in the source water that may adversely affect treatment costs or the quality of finished water (i.e., due to taste, odor, turbidity, dissolved solids, etc.)

Notes:

1. Conventional treatment is defined as coagulation, sedimentation, disinfection, and conventional filtration.

2. Upon request, DES has historically used copper sulfate to control algal blooms caused by cultural sources of phosphorus. In recent years, most copper sulfate treatments have been requested by owners of water supplies to control taste and odor or filter clogging problems associated with algal blooms. Where copper sulfate treatments were conducted for this purpose within the last 2 years, the water supply was assessed as NS as this is considered “more than conventional treatment”.

3. See section 3.1.23 for determining waters that should be placed in Category 5.

3.2.6 Use: Fish Consumption

Definition: Waters that support fish free from contamination at levels that pose a human health risk to consumers.

Applicability: All surface waters

Core Indicator(s):

Fresh waters: Fish Consumption Advisories based on health risk analyses to determine if advisories are necessary due to mercury in fish tissue.

Tidal waters: Fish Consumption Advisories based on health risk analyses to determine if fish consumption advisories are necessary due to mercury and polychlorinated biphenyls (PCBs) in fish tissue.

Assessment Criteria: **The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.**

Indicator 1: **Fish Consumption Advisories due to toxics**

FS: No fish "restricted consumption" or "no consumption" advisories or bans are in effect.

NS: "Restricted consumption" or "no consumption" advisories or bans for fish are in effect.

Notes:

1. Fish consumption advisories are issued by the New Hampshire Department of Health and Human Services. The advisories are based on risk assessments to determine if any portion of the human population would be at risk eating fish due to pollutant concentrations in fish tissue. A summary of fish consumption advisories in NH is available on the web at http://www.dhhs.state.nh.us/DHHS/HLTHRISKASSESS/LIBRARY/Fact+Sheet/mercury-facts.htm

2. All waters with fish consumption advisories or bans due to pollutants that do not need a TMDL for reasons discussed in section 3.1.23 shall not be placed in category 5 for that particular pollutant. For this assessment, this applies to the fish consumption advisory on the Adroscoggin River due to dioxin. The primary source of dioxin was from a paper mill in Berlin. In 1994, the mill changed its bleaching process to a much cleaner, elemental chlorine free process. As a result, dioxin measurements have dropped below minimum detection levels and fish tissue concentrations have declined. Since the source has been essentially eliminated, a TMDL is not needed for this situation.

3. For this cycle, all surface waters in New Hampshire will be placed in Category 5 primarily as a result of the statewide fish consumption advisory for mercury in fresh waters and for mercury and polychlorinated biphenyls (PCB) in tidal waters. For regionally generated pollutants such as mercury, PCBs and dioxins (in some cases) which are beyond the ability of the State to control, it is recommended that EPA take the lead in conducting the TMDLs.

3.2.7 Use: Shellfish Consumption

Definition: Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers

Applicability: All tidal waters

Core Indicator(s): Classification of shellfish waters based on fecal coliform concentrations (pathogens) in the water column in accordance with the National Shellfish Sanitation Program (NSSP).

Shellfish Consumption Advisories based on health risk analyses to determine if shellfish consumption advisories are necessary due to mercury and polychlorinated biphenyls (PCBs) in fish tissue.

Assessment Criteria: **The following criteria are in addition to the general assessment and listing criteria provided in Section 3.1.**

Indicator 1: **NSSP classifications based on fecal coliform concentrations (pathogens) in the water column.**

FS: The surface water is classified as "approved" based on fecal coliform violations measured and assessed in accordance with the NSSP criteria**.**

NS: The surface water is not classified as "approved" based on fecal coliform violations measured and assessed in accordance with the NSSP criteria.

Notes:

1. The DES Shellfish Program is responsible for implementing the NSSP program and for determining NSSP classifications.

2. Shellfish areas lacking sufficient fecal coliform data to classify them in accordance with NSSP criteria shall be assigned an attainment status of "insufficient information". Examples include shellfish areas closed for administrative reasons such as lack of a current sanitary survey or a safety management zone around wastewater treatment plants or marinas.

3. See section 3.1.23 for determining waters that should be placed in Category 5.

Indicator 2: **Shellfish Consumption Advisories due to toxics**

FS: There are no "restricted consumption" or "no consumption" advisories or bans for shellfish in effect.

NS: "Restricted consumption" or "no consumption" advisories or bans for shellfish are in effect.

Shellfish Consumption (continued)

Notes:

1. Shellfish consumption advisories are issued by the New Hampshire Department of Health and Human Services. The advisories are based on risk assessments to determine if any portion of the human population would be at risk eating shellfish due to toxics in shellfish tissue. A summary of fish consumption advisories in NH is available on the web at http://www.dhhs.state.nh.us/DHHS/HLTHRISKASSESS/LIBRARY/Fact+Sheet/mercury-facts.htm

2. All waters with shellfish consumption advisories or bans shall be listed as impaired and either placed in Category 4B or 5 depending on the status of efforts to reduce shellfish tissue pollutant concentrations to levels that do not warrant an advisory.

3. For this cycle, all tidal waters in New Hampshire were placed in Category 5 primarily as a result of the shellfish consumption advisory for mercury and polychlorinated biphenyls (PCB) and dioxins. For regionally generated pollutants such as mercury, PCBs and dioxins (in some cases) which are beyond the ability of the State to control, it is recommended that EPA take the lead in conducting the TMDLs

3.2.8 Use: Wildlife

Definition: Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.

Applicability: All surface waters

Core Indicator(s): Under development

Assessment Criteria: Criteria for determining use support is under development. For this cycle, all surface waters will be assessed as "Not Assessed" for this use.

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